R8750-2.40F 4/88

POPULATION BULLETIN
Vol. 43, No. 2, April 1988

Food and Population: Beyond Five Billion

By Peter Hendry

PRB A publication of the Population Reference Bureau, Inc.

Abstract—World food production is rising, but population is also increasing. And so are the numbers of those who, either temporarily or chronically, do not have sufficient food, although the proportion of world population suffering undernutrition is declining. We live in a world of over 5 billion people where feast and famine—food shortages and food surpluses—occur simultaneously. The U.S. government pays farmers not to plant crops, to cut surpluses and prevent further erosion, while also providing more than 19 million people a month with food stamps so they can obtain food.

The developing countries, with about three-quarters of the world's population, account for less than half of the production of major food crops. The Third World's per capita food production of 260 kilograms in 1982 was only one-third of that in the developed countries. Yet China and India, the most populous countries in the world, have cut fertility rates and moved to food self-sufficiency.

An illustration of the food/population dynamic is that although production of food staples in North Africa and the Middle East is projected to expand at about the same rate as that of Asia, about 2.9 percent annually, owing to a much more rapid rate of population increase, they will achieve only a 0.2 percent annual increase in output per person, compared with a 1.4 percent annual growth rate in Asia. In the longer term, higher dietary levels per capita for a world population double that of the present (the UN medium variant of 10.2 billion in 2100) would imply at least a tripling of demand for dietary staples. But more intensive cultivation would place natural resources, many already degraded, under much greater stress. Balancing population, food, and resources for sustained survival is a continual process.

The principle cause of hunger and malnutrition is poverty: the extent of popular access to gainful employment, to arable land, to suitable technologies determines nutritional status more than aggregate food production.

Editor: Roberta Yared
Production Assistant: Tracey A. Smith
Graphics: Joanna Lawrence

The *Population Bulletin* is published four times a year and is distributed along with the other publications listed on the back cover to members of the Population Reference Bureau. If you would like to order additional copies of this *Bulletin* or join PRB, contact the Population Reference Bureau, Inc., Circulation Department, 777 14th Street, N.W., Washington, D.C. 20005; telephone: (202) 639-8040. Visa and MasterCard accepted. Annual PRB membership rates *inside the United States:* individuals, $40; educators, $28; students, $20; libraries/non-profit organizations, $50; other organizations, $250. *Outside the United States:* individuals, $50; educators, $35; students, $25; libraries/non-profit organizations, $65; other organizations, $315.

For information on other *Population Bulletins* and *Bulletin Slides*, see page 40.

The suggested citation, if you quote from this publication, is: Peter Hendry, "Food and Population: Beyond Five Billion," *Population Bulletin*, Vol. 43, No. 2 (Washington, D.C.: Population Reference Bureau, Inc., April 1988). For permission to reproduce substantial portions from the *Population Bulletin*, write Population Reference Bureau, Inc., Permissions, 777 14th Street N.W., Washington, D.C. 20005.

© 1988, by the Population Reference Bureau, Inc.

The *Population Bulletin* is indexed in *GEO Abstracts, PAIS Bulletin, Population Index, Social Sciences Index,* and *Social Sciences Citation Index*. It is included in the coverage of *Current Contents/Social and Behavioral Sciences*, Biosciences Information Service of Biological Abstracts and the CICRED/UNFPA *Review of Population Reviews*, and is available in microform from University Microfilms Inc., 300 North Zeeb, Ann Arbor, MI 48106. Selected *Bulletins* are also included in the coverage of and available on microfiche through ERIC Systems.

Food and Population: Beyond Five Billion

By Peter Hendry

	Page
Introduction	3
Global Nutritional Status	5
Vulnerability	7
Factors in Increased Food Production	9
Shift from Subsistence Farming	11
Environmental Degradation	12
Prospects for the Future	13
Population Projections	13
Projected Food Requirements	15
The Gap Between	16
The Earth's Carrying Capacity	17
The Future Most Critical Areas	18
Dynamics of Food/Population Interaction	19
Population Pressure and the Environment	19
Impact of Urbanization	22
Access to Food	23
Protecting the Resource Base	24
Short-term vs. Long-term Tradeoffs	24
Prospects for Continuing Increases	26
Food Security	28
International Aspects	29
National Interventions	31
Population Policy Initiatives	32
Improving the Bottom Line	35
Back to Malthus	36
References	36
Suggested Reading	39

Box

1. Malthus on Population	4

Tables

1. People and Food: World's Ten Most Populous Countries	10
2. Population Projections of Major Regions of the World, 1985-2025	15
3. Price of Food Relative to Income and Energy Content of Diet	28

Figures

1. Average Daily Calorie Supply Per Person	6
2. Growth of Population and Food Production: 1971-1984	7
3. Possibilities of Increased Food Production: 1982/84-2000	9
4. The Agricultural Work Force: 1950-2025	12
5. Population with Deficient Diets, 1970 and 1980	16
6. World Soil Suitable for Agriculture	18
7. Per Capita Grain Production: 1950-1985	20
8. Food Imports As Percentage of Total Food Supplies	30

POPULATION BULLETIN
Vol. 43, No. 2, April 1988

U.S. Department of Agriculture

Wheat is the leading grain/cereal produced worldwide, with rice a close second.

Food and Population: Beyond Five Billion

By **Peter Hendry**

Peter Hendry was Chief Editor of Ceres, *the review of the Food and Agriculture Organization of the United Nations from 1977 to 1987. He had previously served as Senior Information Advisor for FAO, North American Region, in Washington, D.C. between 1969 and 1977 and as Editor of Canada's national farm magazine,* Family Herald, *from 1964 to 1968. The Canadian editor and writer is presently a free-lance writer based in Guelph, Ontario, continuing his specialization in issues relating to international agricultural development.*

The author notes with gratitude the advice and assistance of Joop Alberts, FAO Population Program Coordinator, and Alain Marcoux of the FAO Economic and Social Policy Department at FAO headquarters in Rome, Italy.

In a world noted for the celebration of anniversaries of every variety, perhaps it is not too soon to ponder what kind of commemoration will be accorded the bicentennial, only a decade away, of the publication of Thomas Malthus' treatise, *An Essay on the Principle of Population*. We must recognize his contribution as a founding father of population study and in signaling the relationship between the growth of human population and its ability to feed itself. But, as we close out the twentieth century with 4 times the human population it had at its beginning, will we be obliged to acknowledge his foresight or permitted to celebrate his misjudgment?

Malthus said—to oversimplify—that there would always be too many people, too little food. (See Box 1, page 4.) There have been, of course, developments he could scarcely have foreseen: expansion of world cropland to more than double its 1850 acreage; development of agricultural technologies capable of quadrupling yields achieved by traditional farming methods; and the evolution of international networks of trade, communication, and cooperation leading to a degree of global interdependence inconceivable in the eighteenth century. The global trends toward industrialization and urbanization; the diffusion of health services and improved hygiene, lowering death rates and then birth rates; and the political independence of hundreds of millions of people formerly under the colonial rule of European countries have equally changed the situation since the lifetime of Malthus. He would never have predicted, for instance, farmers being paid not to plant, in order to cut surpluses and to reverse erosion, that reduced the harvested area of cereals and soybeans in America by 10 percent in 1986. U.S. farm subsidies mounted to more than $26 billion in 1987, while food stamps were distributed to over 19 million individuals to enable them to obtain food (average monthly number of recipients in fiscal year 1987 was 19.1 million). And he would be amazed at a growth in world population of 548 million from 1980-1987.

Famine, hunger, and malnutrition are now considered remediable afflictions of humanity that could be eliminated. Generous contributions are made to alleviate situations in which people face a critical food shortage and techniques and technology from several disciplines continue to expand production.

Box 1. Malthus on Population

Thomas Robert Malthus (1766-1834) reasoned as follows:

"First, That food is necessary to the existence of man.

Secondly, That the passion between the sexes is necessary and will remain nearly in its present state. ...

Population, when unchecked, increases in a geometrical ratio. Subsistence increases only in an arithmetical ratio. A slight acquaintance with numbers will shew the immensity of the first power in comparison of the second. ... the human species would increase in the ratio of 1, 2, 4, 8, 16, 32, 64, 128, 256, 512, &c. and subsistence as 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, &c. ...

Through the animal and vegetable kingdoms, nature has scattered the seeds of life abroad with the most profuse and liberal hand. She has been comparatively sparing in the room and the nourishment necessary to rear them. ... And it appears, therefore, to be decisive against the possible existence of a society, all the members of which should live in ease, happiness, and comparative leisure; and feel no anxiety about providing the means of subsistence for themselves and their families.

Consequently, if the premises are just, the argument is conclusive against the perfectibility of the mass of mankind."

Malthus summarized his thinking in his principle of population: "The power of population is indefinitely greater than the power in the earth to produce subsistence for man." The fluctuations of this "perpetual oscillation" between population growth and food supply cause "misery and vice" as do the checks on population increase, namely starvation, disease, wars, and sexual restraint.

One of the first reactions to *An Essay on the Principle of Population* in the England of 1798 was Prime Minister William Pitt's withdrawal of his Bill to aid the poor from Parliament, following the advice in the *Essay*. The short pamphlet was published anonymously, when the Rev. Robert Malthus was both a Fellow of Jesus College at Cambridge University and an Anglican curate in Surrey. Malthus graduated with honors as a mathematician from Jesus College and had been ordained by the Church of England, despite a speech impediment from a cleft palate. He had to resign from Cambridge in 1804 to marry at the age of 38 (they eventually had three children). Malthus held the first chair of political economy in England, at the College of the East India Company from 1805 until his death in 1834. He developed the concept of diminishing returns in his later economic writing, and revised the *Essay* through seven editions.

The full title of his first, and most famous, work is *An Essay on the Principle of Population, as It Affects the Future Improvement of Society, with Remarks on the Speculations of Mr. Godwin, M. Condorcet, and other writers*. Malthus wrote it to reply to ideas put forth by Robert Wallace, Benjamin Franklin, William Godwin, the Marquis de Condorcet, and others following the American and French Revolutions. It was written as part of an ongoing—and still continuing—debate about man and society.

Quotations are from Malthus, *On Population*, Gertrude Himmelfarb, ed. (New York: The Modern Library, Random House, 1960)

So the debate continues. Is Malthus, ultimately, correct? Are there too many people? Do our new skills and knowledge merely postpone his pessimistic scenarios, or prove him wrong? Have we developed a sustainable balance between people and resources? Can we eliminate hunger? The variety of national experiences and circumstances establishes a diversity of perceptions on the subject.

We live in a world of more than 5 billion people where feast and famine occur at the same time, simultaneous food shortages and food surpluses. This *Bulletin* will explore probable causes and possible remedies of the problem of human hunger in seeking a clearer understanding of the relationship between food and population.

Global Nutritional Status

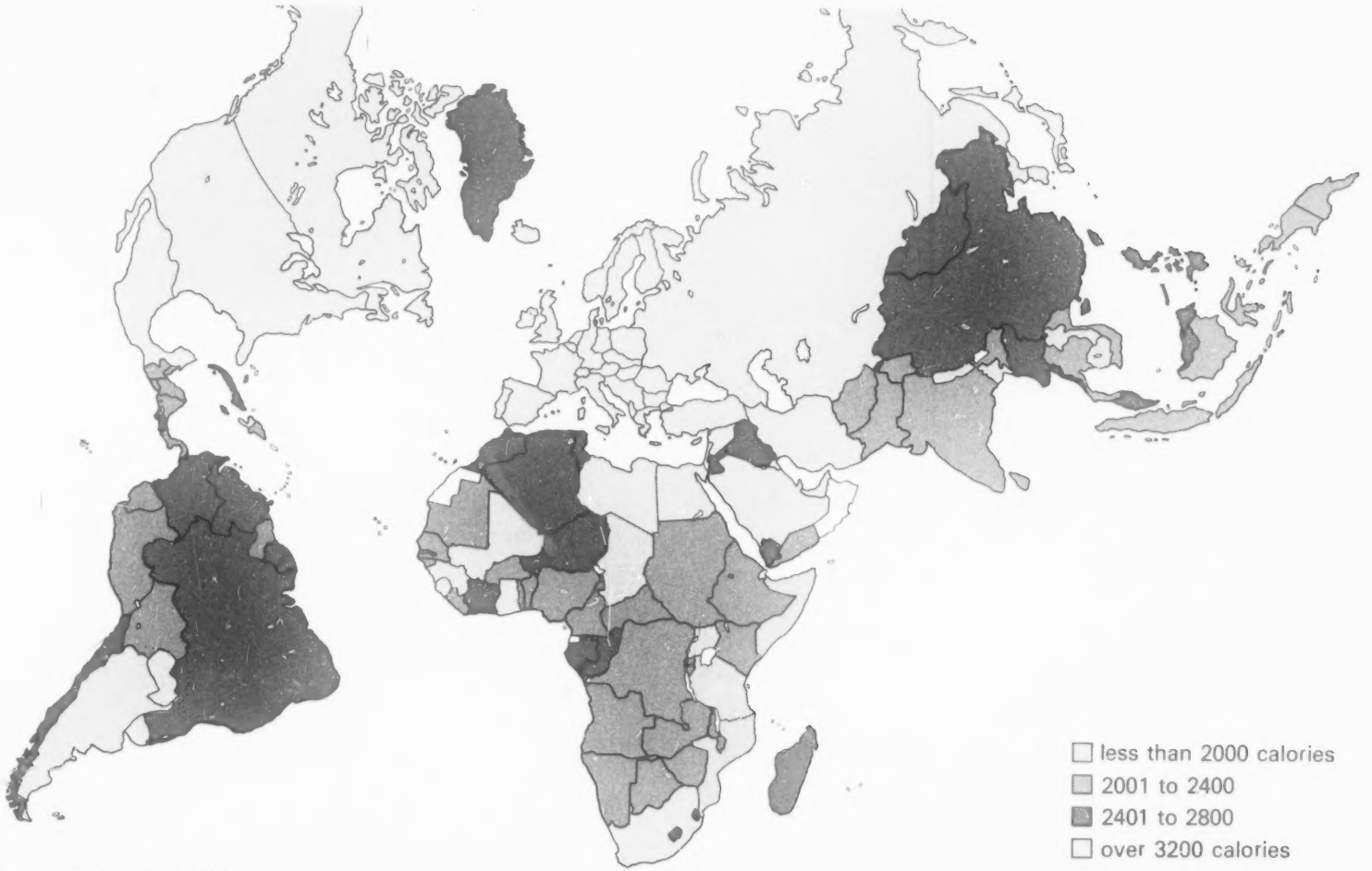
Any debate concerning whether we are winning or losing the battle to reduce world hunger is reminiscent of the hoary argument about whether a glass is half empty or half full. The evidence for either case seems irrefutable. Our convictions appear to be conditioned as much by viewpoint as by statistics. Consider, for example, the following sets of statements:

- During the 1970s world population increased by 750 million. Most of this growth occurred in poor countries, where undernutrition is most serious. In developing countries with market economies, for instance, population increased by 470 million and the number of undernourished there grew by an estimated 22 million. Although their number increased, the proportion of the world's population suffering from undernutrition declined. Undernutrition here usually means diets which do not provide enough energy for a normal working, physically active life, as well as the temporary or chronic lack of food which can lead to illness and death.
- During the period 1961-80 food production in developing countries expanded by 3.1 percent a year—significantly faster than population, which grew 2.4 percent a year.[1]
- In the two decades between 1961 and 1981, global food supplies, expressed in terms of dietary energy per person per day, increased from 2,340 to 2,630 calories. (Per capita dietary energy supplies are measured as energy equivalents of quantities of food items available for human consumption.)
- Among 112 countries included in the Fifth World Food Survey of the Food and Agricultural Organization (FAO), 75 nations achieved at least some increase in per capita dietary energy supplies in the period between 1961 and 1980 for their 2.8 billion populations. China and India, two of the most populous countries in the world, became self-sufficient in grain/cereal production.
- In 1985, while world media attention focused on the dramatic food crisis in Ethiopia, 12 African countries were able to produce cereal surpluses totalling nearly three and a half million tons.[2]

On the other hand:

- The developing countries, with about three-quarters of the world's population, account for less than half of the production of major food crops.
- The Third World's per capita food production of 260 kilograms in 1982 was only one-third of that in the developed countries. A level of 180 kilograms, around one pound of grain/cereal daily, is considered a subsistence threshold below which lies the malnutrition that stunts physical and mental growth and makes normal physical labor too difficult to maintain.
- In 26 countries, representing 8 percent of the population of the developing countries surveyed, dietary energy supplies per person actually declined during the 1970s. There was a decline in five countries where per capita dietary energy was already 2,100 calories or less: Bangladesh, Guinea, Mali, Mozambique, and Sierra Leone. In 11 countries there was virtually no change in dietary energy supplies, including the following where dietary energy per person remained at 2,100 calories or less: Burkina Faso, Haiti, Nepal, and the islands of St. Christopher and Nevis. North Americans and Europeans averaged over 3,000 calories per capita per day.[3]
- Production of basic food staples in sub-Saharan Africa grew at only 1.7 percent a year during the two-decade period 1961-1980, largely due to poor performance in West Africa where food production was outstripped by population growth by more than two full percentage points.[4] Africa's annual growth rate in food production between 1980-86 was only 2.9 percent, compared to population growth of at least 3 percent.[5]

Figure 1. Average Daily Calorie Supply Per Person



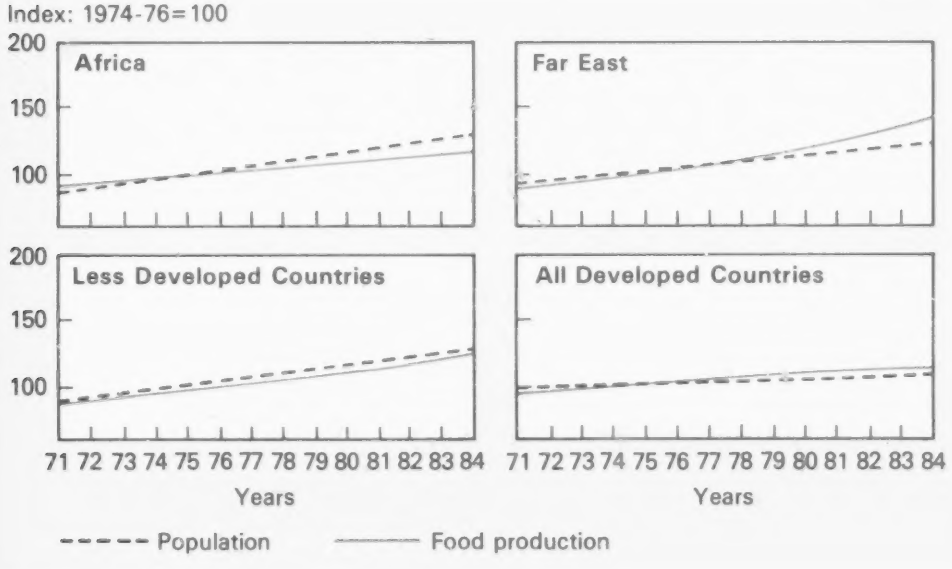
Source: FAO, 1979-81 data.

Vulnerability

What becomes obvious from these apparently contradictory trends is that global averages are of limited usefulness in trying to understand the nature and scope of undernourishment or its relationship to demographic patterns. The need for caution in citing global statistics can be demonstrated by breaking down overall figures to at least the regional level. During the period 1961-80, developing countries, lumped together, showed an annual average increase in food production of 3.1 percent—comfortably above the average annual population growth rate of 2.4 percent. This apparent progress, however, could be mainly attributed to significant production gains in China, which accounts for about 30 percent of the Third World's population and 35 percent of its food output. If China is removed from the calculation, food production gains in other developing countries barely matched population growth. On a regional basis, Asia and Latin America were able to keep food production growing faster than population, but the reverse was true in North Africa, the Middle East, and, especially, sub-Saharan Africa (see Figure 2). However, food production was growing more rapidly than population in some of the world's most populous developing countries, notably Brazil, China, India, and Indonesia.[6]

To identify the people and the locations most vulnerable to hunger requires a much more detailed scrutiny of available data. Access to food varies enormously not only between affluent and impoverished nations, but also within national borders, among different economic and social classes sharing the same locality, and even among members of the same household sharing a common larder. While there is irrefutable evidence that poverty is the most evident common denominator among nations, communities, or households afflicted by chronic undernourishment, it is not the sole determinant. Individual and col-

Figure 2. Growth of Population and Food Production: 1971-1984



Source: FAO

lective responses to the stress of food deficiencies are shaped and conditioned by cultural traditions, social organization, and the political environment.

Under these circumstances, some experts doubt whether it is possible to make an accurate estimate of the global extent of undernutrition.[7] It is generally agreed that undernutrition affects a significant proportion of the Third World's population and that the principle cause of this is poverty. The extent of popular access to gainful employment, to arable land, to suitable technologies, and to other productive resources is likely to be a far more important factor in determining levels of undernourishment than a nation's aggregate food production relative to population.

Food consumption data from developing countries are scarce, especially those comparing rural-urban consumption patterns. One recent survey covering 13 countries in all developing regions indicated that, in every case, average food consumption in urban areas was lower and estimates of undernutrition generally higher than among rural populations. On the other hand, physical malnutrition among children was notably worse in rural areas. Where data were available by income groups, these urban-rural differentials persisted at all levels in Brazil, India, and Tunisia, to cite three cases in different regions. A number of reasons have been suggested to explain this paradox. It is possible that available consumption statistics do not adequately reflect foods which the urban poor obtain and eat outside the home. The better nutritional status of urban children may reflect better access to medical and sanitary facilities, higher quality food, and a more steady supply of food. Urban energy demands are also likely to be less than in rural areas, due to a more sedentary style of life.[8]

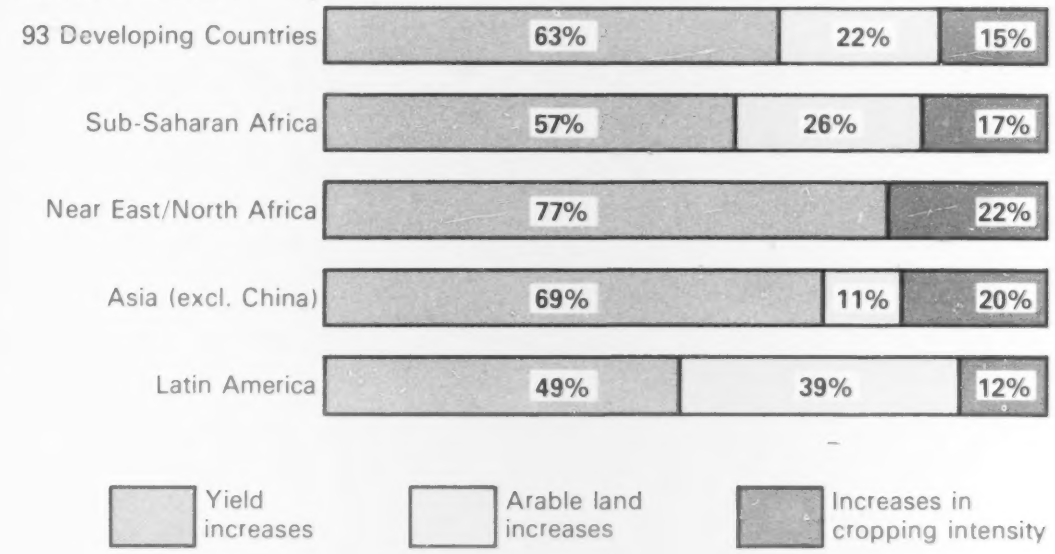
But more dramatic than rural-urban differences are those evident between social classes and income groups. In Manila where per capita daily energy intake in slum areas averages about 200 calories less than in planned residential zones, the incidence of low birth weight was 5 times higher, infant mortality 3 times higher, and severe or moderate malnutrition and anemia twice as frequent in the Philippine slums.[9]

In New Delhi, India, among certain castes in which nearly all women worked in unskilled jobs, death rates of children below 5 years of age reach 444 per 1,000.[10] In Abidjan, Côte d'Ivoire it has been calculated that the probability of dying between 1 and 4 years of age is 15 times greater in slum areas than in more affluent quarters of the city where housing—and mortality rates—are comparable to those in developed countries.[11]

While there has been ample evidence that the Western public is increasingly aware of, and responding to, the desperate plight of the poor in several regions of Africa, some experienced observers question whether the situation presented so dramatically on television screens around the world was not simply the destitution and misery which is the "normal" lot of poor populations in remote areas. "The outside world," says Allan G. Hill, a senior lecturer at the Centre for Population Studies at the London School of Hygiene and Tropical Medicine, "rarely has the chance to discover these high levels of rural poverty but when the destitute collect on roadsides, in refugee camps or on the outskirts of towns and cities, the depths of rural poverty may be being appreciated perhaps for the first time."[12]

He cites demographic surveys conducted in central Mali during 1981-85 which reveal no signs of a peak in child mortality during or just after the 1973-74 drought. Child mortality levels, Hill points out, have been rather constant since the 1950s. What can happen in specific localities is demonstrated by the situation in Mopti, Mali, where child mortality has risen recently as a result of the arrival of destitute groups. About 40 percent of the children of the recent immigrants die before their fifth birthday compared with about 30 percent among long-term residents of the town.

Figure 3. Possibilities of Increased Food Production: 1982/84-2000



Source: FAO

Factors in Increased Food Production

Food production increased in Third World countries, excluding China, by an annual average of 2.9 percent in the 1960s and 2.6 percent in the 1970s. In the '60s, expansion of the area being planted and increased output per hectare (approximately 2.5 acres) contributed about equally to production growth while during the 1970s more than two-thirds of the increase could be attributed to higher yields per hectare.[13]

A recently revised FAO survey of 93 developing countries estimates that to meet food production requirements at the end of this century, another 83 million hectares will have to be added to the present 770-million-hectare area of farmable land, and cropping intensity will have to be increased from 78 to 84 percent, thus allowing for an additional 115 million hectares of harvested land.[14] At first glance, such expansion would appear modest in comparison with the 1.3 billion hectares of arable land that would still be in reserve at the end of the century, but the FAO study cautions that most of these reserve areas contain soils of marginal quality and some are located in regions of unreliable rainfall. Moreover, much of the reserve land is located in just two countries, Brazil and Zaire. Most developing nations will have to depend on better yields and multiple crops from the same land (increased cropping intensity) to achieve higher food production (see Figure 3). However, substantial yield increases obtained during the 1960s and 1970s for rice and wheat grown on irrigated land are yet to be matched with similar advances in other basic food crops such as barley, millet, and pulses (peas and beans) normally grown with only natural rainfall. Only some 7 percent of African cropland is irrigated, for example, two-thirds of the total being in Egypt, the Sudan, and South Africa.[15] High-yielding varieties developed for one area may not transfer smoothly to other parts of the world. The rice strains producing the "Green Revo-

lution" in Asia do poorly in African environments, and require amounts of water, pesticides, and fertilizers few African farmers can provide. Rice varieties for rainfed uplands, mangrove swamps, and irrigated land are now being developed for African growing conditions and tastes at a research center in central Côte d'Ivoire.[16]

For many developing countries endeavoring to enhance national food security, stable production levels of basic food crops is at least as important as obtaining dramatic yield increases. Yet, with few exceptions, the output of major staple foods has been unstable in developing countries. From studies of variations in food production in 18 developing countries, the World Bank has calculated that over the 10-year span between 1968 and 1978, the average coefficients of variation were 18 percent for wheat, 14 percent for maize, and 8 percent for rice. The respective global figures were 5, 4, and 3 percent.[17]

While it has been customary to attribute yield increases to the introduction of modern agricultural inputs and technologies such as those associated with the Green Revolution in India, a longer range perspective on traditional farming systems suggests that these are in no way as stagnant as is often imagined and have, indeed, been adapting both to external markets and to changes in population densities. The introduction or increased use of organic manuring and draft animal power for cultivation have been representative of such adjustments as farming practices have shifted to more intensive cropping. Some studies have indicated that identical or strikingly similar solutions to the need for increasing food production have been found independently by farmers themselves in many places all over the world.[18] The critical question, of course, is whether farmers' own innovations and their related investments will continue to match growing food demand in the Third World, or whether, as has been the case for agriculture in the industrialized world, more science-based technology will have to be introduced.

A major problem is that most developing countries have generally opted for "cheap food" policies, welcoming food aid and easy credit to purchase their staple cereals from surplus-burdened developed countries. When successive and widespread crop failures in the early 1970s suddenly pushed cereal prices to 3 times the existing level, these countries were in trouble. The damage that such policies and related measures have done to the domestic agricultural sector which

Table 1. People and Food: World's Ten Most Populous Countries

	Population 1988 (est.) (millions)	Total Fertility Rate* 1987 (1980)	Grain Yield kilograms/ hectare	Arable Land % of Total	Daily Calorie Supply per capita (1985)	GNP (US$) per capita (1985-86)
China	1,080	2.4 (2.3)	3,825	11	2,602	300
India	817	4.3 (5.3)	1,566	57	2,189	270
USSR	286	2.5 (2.4)	1,563	10	3,440	7,400
U.S.A.	246	1.8 (1.8)	4,279	21	3,663	17,500
Indonesia	177	3.3 (4.1)	3,413	11	2,533	500
Brazil	144	3.4 (4.4)	1,708	9	2,633	1,810
Japan	123	1.7 (1.8)	5,705	13	2,856	12,850
Bangladesh	109	5.8 (6.3)	2,125	68	1,899**	160
Pakistan	107	6.6 (6.3)	1,605	26	2,159	350
Nigeria	106	6.6 (6.9)	719	33	2,038**	640

*Total Fertility Rate is the average number of children born to a woman during her lifetime.
**Declined from 1965 figure.

Sources: FAO, International Institute for Environment and Development/World Resources Institute, World Bank, PRB *World Population Data Sheet 1987* and *1988*.

remains the predominant industry and activity in most developing countries has been recognized. Change is not easy, even at the best of times, and this is a period of economic crisis when North American and Western European nations, major agricultural exporters, are engaged in fierce competition for world markets. Many developing countries face problems with volatile masses of unemployed or underemployed migrants who have moved to major cities from rural areas. The provision of cheap food becomes necessary if the government wishes to avoid trouble over price increases on staple food items: troops have had to be called out to quell food-related riots in Brazil, Egypt, and Tunisia in recent years.

Shift from Subsistence Farming

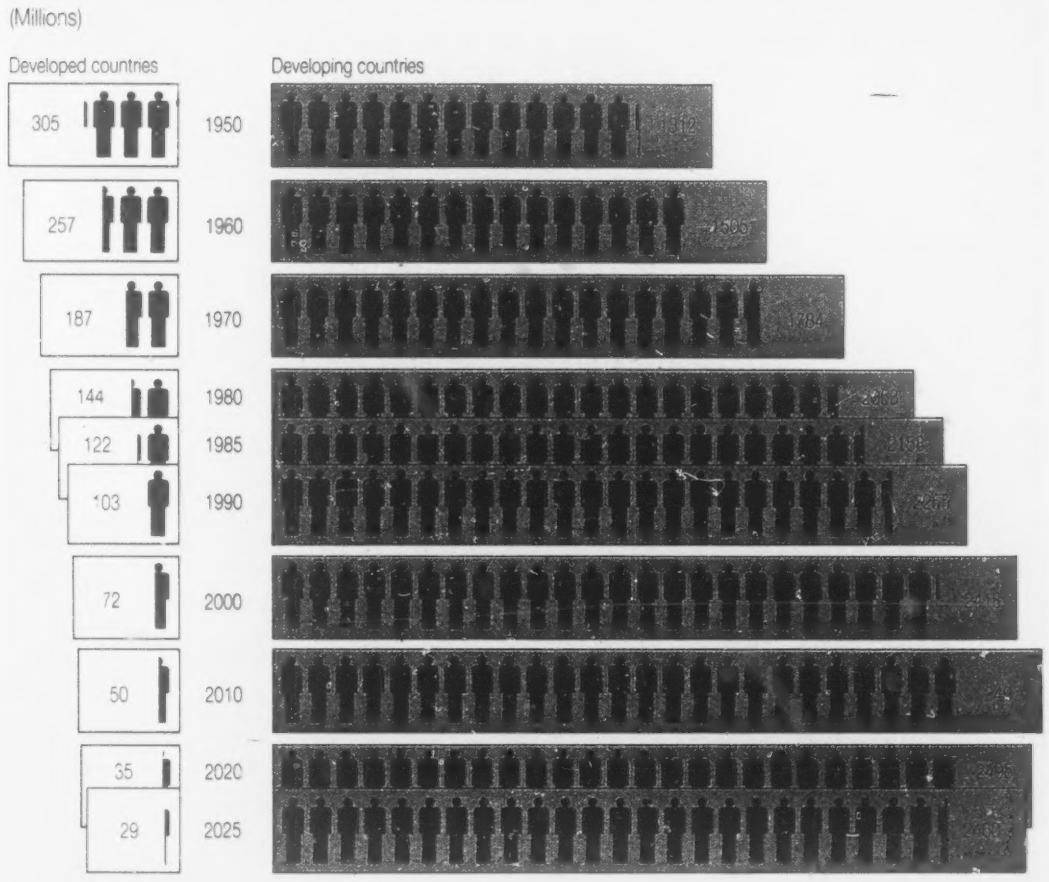
Any pronounced shift to modern agricultural technology implies corresponding structural changes in traditional agricultural systems. In regions where subsistence agriculture predominates and as much as two-thirds or more of the total population are engaged in agrarian pursuits, a farm family of five may find a market of not more than two other persons to purchase surplus food from their output. As the proportion of agricultural population declines, the potential market for surplus production increases. With 20 percent of total population engaged in agriculture, it is estimated that the average family farm unit could find a market for as many as 20 additional persons.[19]

Opportunities for traditional rural societies to materially enhance their standard of living are closely linked to the decline in the proportion of the farm population. About half the population of the world today is working or seeking work in agriculture. Only 10 percent of the population in the developed countries in 1985 were in the agricultural sector, shrinking from 38 percent of the population in 1950. There has been a much slower diminution in the developing nations, from 81 percent in 1950 to 63 percent in 1985 (see Figure 4). A drop to 38 percent is foreseen in the year 2025.[20] The decline in the agricultural work force in the developed states was matched with a consequent rise in productivity, so that the average family in these countries had food budgets that normally did not exceed 30 percent of disposable income. The European Economic Community has continual political problems setting production levels and cutting subsidies, yet a February 1988 study says the number of farmers in the 12 Common Market countries will continue to fall, going from a current 10 million to 5 million by the end of the century.[21] One explanation for the "butter mountains" and other surpluses is that farming productivity has increased 25 percent in the past quarter century in France alone.

The size of the overall domestic population as well as export opportunities are obvious influences in the shift to commercial farming. However, one point seems clear: in the earliest stages of transition from traditional subsistence agriculture to commercial farming, production incentives arising from the domestic marketplace are generally weak. At the same time, demand for purchased inputs for food production is also restricted.

What has happened in many developing countries, however, is that modern technology has been introduced only to a relatively small segment of the agricultural sector, most frequently that producing export crops. The result is a bimodal pattern of agricultural development in which highly commercial farm enterprises, usually comprising a fifth or less of the national total, may account for two-thirds or three-fourths of all marketed output, while a traditional sector remains trapped in its stagnant environment, ill-equipped to compete with the modern sector for land, labor, or other inputs.

Figure 4. The Agricultural Work Force: 1950-2025



Source: FAO

Environmental Degradation

Ever more intensive use of land and water resources in order to meet demands from rapidly expanding populations for increased food production carries implications for the sustainability of those resources. There is tangible evidence that resources necessary for food production in many regions are under severe stress: we can see the "progress" of deforestation, soil degradation, and desertification. This has inspired predictions that global environmental degradation will soon threaten human survival itself. Many such warnings have assumed a direct link between population growth and environmental deterioration and have reached over-simplified general conclusions. Poor land management, poverty, inappropriate technologies, and other factors join population growth as culprits. But "the greater the population and the higher its energy use, the greater the entropy effect. . . . there is no free ride in nature."[22]

Population density, for example, is not an infallible indicator of the pressure upon resources. While there is evidence that growing population pressures have

contributed to the shortening of periods where the land rests fallow in traditional agricultural systems and to removal of forest cover, simply tabulating the number of people per square kilometer doesn't tell us much about the relationships between population and resources. Declining population in the Himalayan foothills of Nepal has coincided with increased problems of erosion, for instance, because migration to the cities has claimed those who were most capable at terracing and other soil conservation techniques.[23]

The 1974 World Population Conference in Bucharest, Romania recommended more unified and analytical research into "the complex relations among the problems of population, resources, environment and development" but progress in this field remains limited.

Some general patterns, however, may be detected. One consequence of rapid population growth in the Third World has been the dramatic increase in urban populations. Urbanization in Africa, for example, has the highest growth rate in the world, estimated at 4.9 percent for the period from 1985-1990. While the process started later in the developing countries, the estimated size of the urban population was nearly the same in developed (698 million) and developing (673 million) by 1970. Over 40 percent of world population in 1985 were urban residents, and the percentage is expected to pass 50 percent before the year 2010, according to United Nations projections.[24] This rapid urbanization, combined with continuing growth of rural populations as well, makes less feasible those traditional farming systems based on extensive use of land. Given less land and increased pressure for more foodstuffs, fallow periods are shortened or even eliminated and more land that is marginal and submarginal for agriculture is used for growing crops.[25]

One study has estimated that more than 1.1 billion people are living in areas of the developing world where the population has already exceeded the carrying capacity of the land.[26] Narpat S. Jodha, who heads the Farming Systems Division of the International Center for Integrated Mountain Development (ICIMOD) in Nepal, maintains that the problem of overexploitation and degradation of natural resources is greater in the low-productivity, high-risk environments such as dry tropical regions. He cites the depletion of India's so-called "common property" resources as an example. In the past, commonly held resources such as forests, pastures, and wastelands were an important element in the villagers' system of self-provisioning. It has been estimated that such resources contributed, directly or indirectly, as much as a quarter of total household income. But as land use has intensified, common property resources have been severely affected. Regardless of their suitability, many have been converted into cropland under private ownership. Recent studies in 80 villages in the dry tropical zones of seven Indian states indicate that the areas set aside as common property resources have declined between 31 and 55 percent, depending on location. Pressures on the remaining common lands have consequently increased. Many products that villagers once gathered regularly from the commons are now no longer available. The number of watering places, vitally important for common grazing lands, has also declined.[27]

Prospects for the Future

Population Projections

The population projections that have been made for the near term are considered relatively secure. Even though the historic peak in global population growth rates—2 percent per year in the 1960s and early 1970s—is now behind us, the absolute annual population increase will continue to rise because of demographic momentum. In 1987, the

BEST AVAILABLE COPY

annual increase was 87 million, including 17 million Indians and 15 million Chinese. Annual population increases are projected to grow to a high of about 90 million in the late 1990s, before they begin a long period of decline.

But while the world's population as we enter the 21st century can be reasonably anticipated at slightly above 6 billion and at 7 billion a little after 2010, projections beyond that point become more speculative. For instance, the Chinese birth rate recently took an unexpected upward swing and India's fertility decline has not been as rapid as projected. The United Nations Population Division offers four scenarios for the year 2100, with global populations ranging from a low of 7.2 billion to a high of 14.9 billion, depending on fertility levels attained over the next 50 years. UN projections for the year 2025 range from 7.4 billion (low variant) to 8.2 billion (medium variant) to 9.1 billion (high variant).[28]

The UN medium variant offers a world population stabilizing in the year 2100 at 10.2 billion, approximately double present global population. To achieve this, however, would require that world fertility decline to the replacement level of approximately 2.1 children per woman by the year 2035. (Fertility is presently estimated at 3.6 per woman, ranging from 8.5 in Rwanda and North Yemen to 1.4 in West Germany and Italy.)

The timing of changes in fertility has an enormous impact on the ultimate level of population reached over a given period. If the date for achieving replacement-level fertility is delayed by 20 years, the global population at the end of the next century would be 2.8 billion greater than the projected medium variant. On the other hand, if replacement-level fertility were to come 20 years earlier, i.e., in 2015, the century-end population would be 2.2 billion less. The difference adds up to the equivalent of the world's total present day population.[29]

Developing countries account for 95 percent of the total population increase between now and the middle of the 21st century. By the year 2025, the UN projects that 83 percent of the world's population will be in the less developed regions, with some 6.8 billion people compared to 1.4 billion in industrialized countries (see Table 2). Regional variations in growth rates will cause considerable shifts in population distribution. The world's most populous region, Asia, is projected to have the slowest population growth rate in the developing world, 1.1 percent through 2025 compared with the 2.3 percent annual average recorded during the 1960s and 1970s. This substantial reduction can be largely attributed to China's achievement in reducing population growth to just over 1 percent per annum. If current trends continue, India may be the most populous country in the world at century's end. Thus, even with China's drop in fertility, Asia's population by the end of this century, at 3.5 billion, will represent about three-fourths of the Third World total and would be more than half of the world population.

Africa, with a present growth rate of 2.8 percent that would double its population in 24 years, is expected to emerge as the second most populous region of the world. A slight decline in the rate of growth is not expected until early in the 21st century. Africa's population is expected to reach one billion, double its 1982 level, some time between 2000 and 2005.

Latin America, like Asia, is projected to show a significant deceleration in population growth. Its projected growth rate of 2.1 percent will bring it to a population of over 540 million by the end of this century. The low growth, below replacement level patterns exhibited in Europe, North America, and Japan are projected to continue well into the next century. Though relatively small, the absolute growth in the more developed countries population would be in the order of 270 million, roughly equivalent to the present population of the Soviet Union (and much of that would result from immigration

Table 2. Population Projections of Major Regions of the World, 1985-2025

(in millions)

	United Nations*			World Bank		
	1985	2000	2025	1985	2000	2025
World	4,837	6,122	8,206	4,840	6,176	8,188
Less Developed	3,663	4,845	6,809	3,663	4,913	6,850
Africa	555	872	1,617	560	871	1,495
Latin America	405	546	779	398	529	715
Asia & Oceania	2,703	3,427	4,414	2,704	3,513	4,639
More Developed	1,174	1,277	1,396	1,177	1,263	1,338
USSR & E Europe	391	435	499	389	426	469
Other Developed	783	842	897	788	837	869

*medium variant

Note: More developed countries comprise all of North America, Europe, the USSR, Japan in Asia, and Australia and New Zealand in Oceania. Yugoslavia is included in other developed countries.

Sources: UN, World Bank

from the developing countries and from growth in the eastern republics of the USSR).

No less significant than the future distribution of population among countries will be the distribution of population within countries. Overall, urban areas in the Third World are projected to grow by over 3 percent annually, accounting for two-thirds of the total population growth in these regions. Large cities will grow even faster. By the end of this century the Third World will have 50 metropolitan areas each with over 4 million population, compared to 28 such centers at the present time. Three out of four people in Latin America and two out of every five in Asia and Africa will be urban residents.

As much as half of this rapid urban growth can be attributed to migration from rural areas. And, indeed, migrants' impact on urban growth may be even greater than a tabulation of their mere numbers would indicate, since the majority of them are young adults and will have higher birth rates than the urban population as a whole.[30]

Projected Food Requirements

If per capita income in the Third World continues to grow at the same pace as it has the past two decades, overall demand for food will expand at a rate of about 2.7 percent per annum. This is significantly above projected overall population growth rates, but slightly less than the projected rate of increase in food production.[31]

On a regional basis, however, only Asia, where food demand is projected to expand at the relatively slow rate of 2.3 percent, will be able to register a growth rate in the output of food staples higher than that of demand. For the rest of the developing world, food demand will grow at rates exceeding 3 percent annually. The most rapid regional expansion is anticipated in North Africa and the Middle East where significant income gains will combine with fairly rapid population growth to accelerate food demand to 3.8 percent per year, or nearly a full percentage point above the region's projected growth rate in food production. In sub-Saharan Africa, rapid population growth will be the major element in boosting food demand at a rate of 3.6 percent annually, substantially above the projected rates of increase in food production.

In the longer term, higher levels of per capita energy intake for a world population double the present 5 billion imply at least a tripling of demand for dietary sta-

ples. This would represent a two-edged challenge to the agricultural sector. On the one hand, in order to produce the equivalent of about 10 billion tons of grain annually, yields matching the 7 tons per hectare obtained by Iowa corn farmers would be required from all of the world's presently cultivated cropland, which currently averages only about one-third of that amount.[32] On the other hand, more intensive cultivation, particularly in tropical zones, would place food production resources under much greater environmental stress.

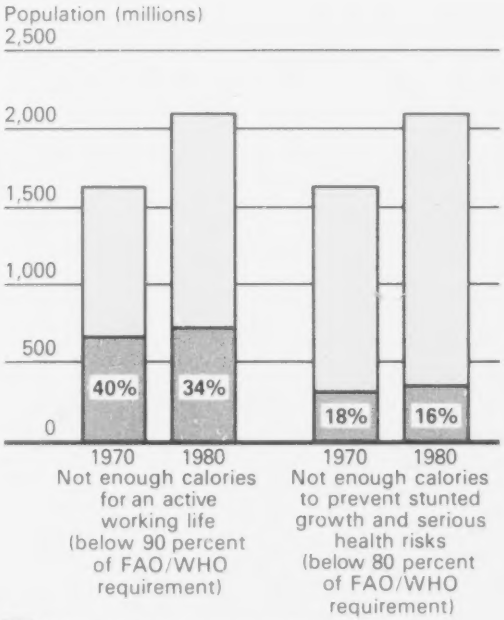
The Gap Between

The World Bank has estimated that there are between 340 million and 730 million people in developing countries (excluding China) who lack the income to ensure an adequate intake of dietary energy. The lower estimate is based on a minimum dietary standard that would avoid serious health risks and prevent stunted physical and mental development in children. However, if a nutritional standard is established to make allowance for an active working life, the estimate of those unable to afford it rises to 730 million.[33] The World Bank estimates that 80 percent of those who are undernourished live in countries with very low average incomes, two-thirds of the total residing in Asia and one-fifth in sub-Saharan Africa.

Although the number of individuals lacking adequate diets is enormous, the total deficiency in their diets is, in most countries, usually equivalent to less than 10 percent of the national food supply. Unfortunately, since elements other than availability enter the picture, merely increasing the food supply is not necessarily a guarantee that undernutrition will be reduced. In the longer term, the problem will be addressed most effectively by ensuring sufficient income-earning opportunities for households chronically short of food. Obviously, in cases where agriculture remains a major element in the economy, well-directed efforts to improve this sector should increase both the availability of food and the disposable income needed for its purchase.

If per capita food consumption in developing countries remains at 1980 levels through to the end of this century—in other words, if no allowance is made for growth in per capita income—requirements for the basic staple foods would be about 1,315 million tons. However, if income growth followed the 1966-1980 trend line, a further 225 million tons would be needed. This projection implies a net food deficit in developing countries of 69 million tons by the year 2000, some 30 percent greater than the deficit at the beginning of the 1980s—even though domestic output of major food crops is

Figure 5. Population with Deficient Diets, 1970 and 1980



Note: 87 developing countries

Source: World Bank

projected to expand by 75 percent through the last two decades of the century.[34]

Here again, regional differences in how population and income grow result in different degrees of pressure on domestic food production. For example, production of basic food crops in North Africa and the Middle East is projected to expand at about the same rate as that of Asia, i.e., 2.9 percent annually, but, owing to a much more rapid rate of increase in population, they will achieve only a 0.2 percent annual increase in output per capita, compared with a 1.4 percent annual growth rate in Asia.

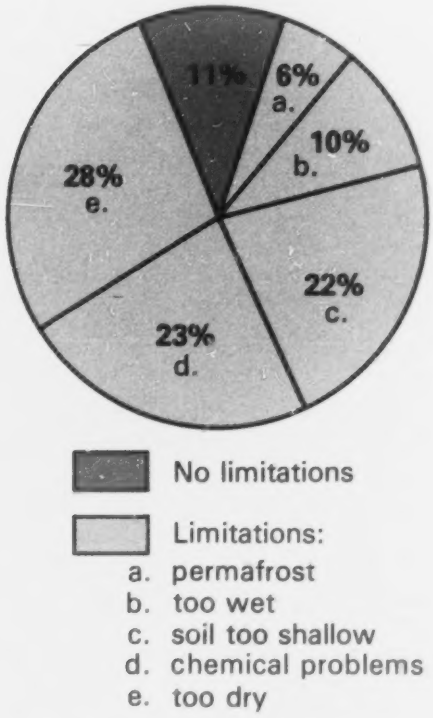
The Earth's Carrying Capacity

The accumulated evidence that rapid population growth may eventually place undue stress on food production resources to the detriment of national food security objectives raises questions about the longer-term capacity of resources within given political boundaries to sustain present or potential populations. One approach linking population with the local natural resource base is the concept of carrying capacity, borrowing the work of biologists on the maximum population of a species that a habitat can sustain. One ambitious study of this type analyzed soil and climate data from 117 developing countries to estimate food production potential in each zone for 15 major crops at three different levels of farming practice: low input, subsistence agriculture; intermediate, with the introduction of some modern technology, conservation measures, and improved cropping patterns; and high level, equivalent to farming practices in industrialized countries.[35] The maximum population that can be sustained by the food output of each country was established on the basis of an average calorie and protein intake recommended in 1973 by a joint committee of the World Health Organization (WHO) and FAO. Projected age and sex distribution of the population was also taken into consideration in calculating each country's requirements.

This type of study, of course, has many limitations. It makes virtually no pretense of being based on economic analysis. Calculations are based on the assumption that all potentially arable land will be used to grow only food crops, with no allowance for cropland to provide livestock feed or to produce non-food cash crops. The elimination of inequities in food distribution within countries, which would clearly increase average food requirements, are not included in the calculations. And although the study is careful to point out that its task was to assess the potential for food self-sufficiency in each country, and not to suggest that this was necessary or desirable, no consideration is given to other national resources or to the potential role of trade. However, many of these simplifying assumptions that are inevitable in any global study can be avoided in similar national studies, now being undertaken in a number of countries.

Among important considerations to emerge from the study's findings are, first, the degree to which figures aggregated globally can obscure potentially critical situations within countries and regions, and, second, the enormous advances in potential population-carrying capacity possible with improved techniques and practices. At the global level, the study indicates that subsistence-level agriculture would have been capable of supporting more than double the 1975 population of 2 billion in the 117 countries surveyed. By the end of the century, however, the margin provided by this level of agriculture will have narrowed significantly. While theoretically capable of supporting 1.6 times the anticipated population of 3.6 billion, no allowance is made for non-food crops or for population expansion in the next century. On the other hand, intermediate levels of agriculture could theoretically support 4 times the population projected for the year 2000 and high-level inputs and

Figure 6. World Soil Suitable for Agriculture



Source: FAO

practices 9 times that population.

It is at the country level that the study's findings assume their most disturbing aspect. Of the 117 countries studied, 54 would have been unable to feed their 1975 populations, a total of more than a billion people, from subsistence-level agriculture. The "excess" population in these countries was calculated at 278 million—more than 25 percent of the total. For the 1975 population levels, however, intermediate-level agriculture would have reduced the number of countries at risk to 24 with only 4 percent of the total population and high technology agriculture would have led to 13 countries in critical condition, with a mere 1 percent of the total population. By the end of the century, however, a projected 83 percent increase in population over the 1975 figure would increase the number of critical countries to 64 at low-level agriculture, 28 at the intermediate level, and 17 at high levels of farming technology.

An analysis of the 64 countries projected to face potentially critical food shortages by the end of the century at low levels of input indicates that most have limited reserves of usable land; two-thirds of these countries are already cultivating more than 70 percent of their potentially arable land. The great majority already face ecological problems. More than half of them are either islands or landlocked nations. While a few of these countries are major oil exporters and can thus afford to offset domestic food deficits with imported supplies, more than half are relatively poor.[36] The main under-utilized areas, in terms of carrying capacity, are to be found in the humid tropics, where, for a variety of reasons, human populations have been reluctant to settle. Conversely, much of the cool and dry tropics and subtropics are already populated beyond their capacity for food production. In Africa, for example, only about a quarter of potential rainfed cropland in the humid tropics is cultivated, while three other swathes of the continent have already surpassed population-carrying capacity at low input levels. Even using the highest-level farming technology, four African countries would remain critical: Cape Verde, Mauritius, Rwanda, and Western Sahara.

The Future Most Critical Areas

One difficulty in trying to identify potentially critical situations on the basis of global or regional food balance data is that deficits in some countries tend to cancel out surpluses in others. To determine how much international trade—or food aid—would be required to alleviate food shortages, it is more useful to look at aggregate surpluses and deficits in re-

gional or subregional terms.

A recent study estimates that by the end of the century 22 developing countries self-sufficient in food staples could have as much as 118 million tons surplus production. This compares with a mere 25 million tons of surplus production in 1980 and would represent an annual increase of about 8 percent. The other side of this coin is that no less than 83 food-deficit developing countries are projected to post a collective shortfall of 185 million tons annually by the end of this century, about two and a half times the total shortfall occurring in food-deficit countries in 1980.

Countries projected to produce surpluses are located in all developing regions, but more than two-thirds of the total surpluses would be accounted for by Asian nations, notably in South Asia, which is projected to produce a gross surplus of 20 million tons, and China, which has already shifted from food-deficient and will go to surplus status. Surplus production in the cone countries of South America—Argentina, Chile, and Uruguay—would be the major factor in the Latin American region's contribution of about 30 percent to the global gross surplus. A handful of countries in central, eastern, and southern Africa would account for most of the remaining surplus.

On the deficit side, the North African/Middle East region would account for the largest gross shortfall, about one-third of the total, with sub-Saharan Africa close behind at 30 percent. On a subregional basis, the largest shortfall, accounting for almost 20 percent of the total, would occur in West Africa.[37]

Dynamics of the Food/Population Interaction

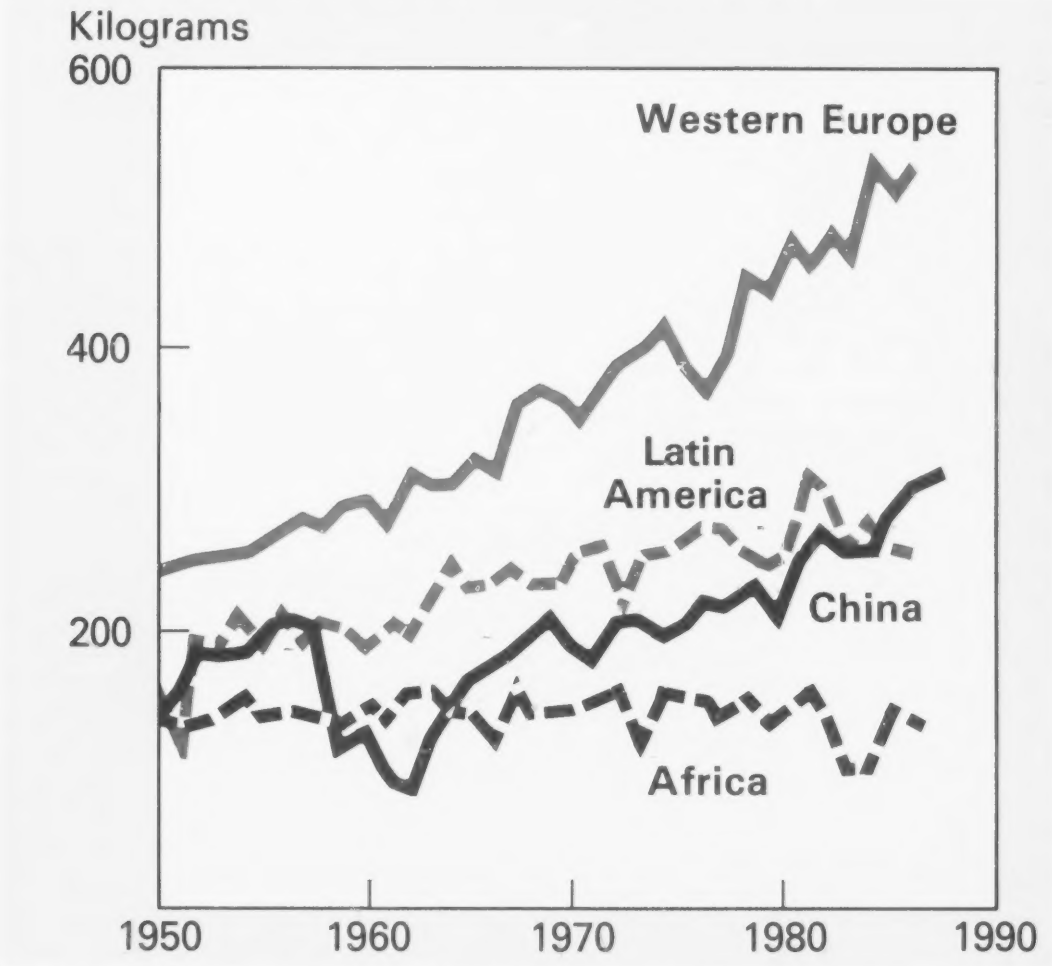
Studies of the potential carrying capacity of different regions, countries, or zones can help to identify the localities and populations most vulnerable to critical food shortages. However, they provide little guidance concerning the interaction between population growth, the utilization of resources for food production, and trends in nutritional status. This is a critical point, since much of the hope for the eventual stabilization of population rests on the assumption that population growth rates will decline as living standards, including nutrition, improve.

But the dynamics of the food/population equation are conditioned by many factors. Undoubtedly, population density within a given area is one determinant of land use. Much concern has been expressed about the environmental impact of mounting population pressures. Yet decisions about family size and about what food is to be produced or acquired with the resources available are made, after all, at the household level and are shaped by individual perceptions and values. The distribution and mobility of population may affect not only the amount of food produced, but the kind of food as well. There is considerable evidence that the process of urbanization is generally accompanied by declining birth rates and by changes in food consumption habits that in turn influence demand for staple foods.

Population Pressure and the Environment

One starting point for much discussion on the impact of population growth is the accumulated evidence of environmental degradation traceable to increasing population densities. The basic contention here is that rapid population growth not only reduces available per capita dietary energy from available food supplies, but also threatens the sustainability of existing levels of food production. "A frustrating paradox is emerging," notes Lester R. Brown and Sandra Postel. "Efforts to improve living standards are themselves beginning to threaten the health of the global economy. The very notion of progress begs

Figure 7. Per Capita Grain Production: 1950-1985



Source: *State of The World 1985* and *State of The World 1987*, copyright Worldwatch Institute.

for redefinition in the light of the intolerable consequences unfolding as a result of its pursuit."[38]

In 1970, Africa as well as China and India produced approximately 180 kilograms of grain per capita per year. African production has since fallen by one-fifth, as shown in Figure 7. "Eroded soils and poorly nourished crops inevitably lead to poorly nourished people."[39]

Specific instances of environmental degradation in areas of rapid population increase are not lacking. Of the billion and a half hectares presently growing crops around the globe, nearly two-thirds have been brought into cultivation since the middle of the 19th century, with a corresponding reduction in a variety of natural ecosystems: grasslands, wetlands, temperate and tropical forests.[40] As much as 50 percent of the world's wetlands may already have been lost.

As population pressures have pushed cultivation from plains and valleys into the hills, an estimated 160 million hectares of upland watersheds in tropical developing countries have been seri-

ously eroded. The World Bank has estimated that under these circumstances an average of 50 tons of topsoil per hectare is lost each year. An FAO study reported that tropical trees were being cut much faster than nature or man could replace the trees. Tropical forests in Central America have been reduced by 38 percent and in Africa by 23 percent in a little over a quarter-century.[41] Deforested areas are more subject to erosion: as the trees that anchor the soil disappear, wind and rain can pick up more soil faster. Runoff means that much of this soil ends up silting and polluting water resources. Trees also absorb carbon dioxide and give off oxygen, offsetting the "greenhouse effect" warming the earth, and have other strong impacts on global and local climates.

On the densely populated island of Java, whose 7 percent of the total national land surface contains 60 percent of Indonesia's population (fifth largest in the world), soil erosion rates range from 3 to more than 20 times greater than in other parts of the country and sediment concentration in the river basins is from 2 to 10 times as great.[42]

In Nigeria, there are reports of increasing conflicts between Fulani pastoralists and sedentary Hausa farmers as growing populations prompt both groups to encroach into the semi-arid zone above the 15th latitude that the government has been trying to protect from settlement and over-grazing.[43]

However, there is a danger of oversimplifying the complex relationships between human populations and nature by attempting to draw general conclusions from specific instances.

The late Rafael M. Salas, former head of the UN Fund for Population Activities, maintained that there is no need to prove particular instances of environmental pollution, natural resource depletion, or climatic change in order to prove that rapid population growth disrupts the balance between nature and man. Instead, he based his argument on the principle of entropy of Nicholas Georgescu-Roegen: "the irrevocable degradation of free energy into bound energy."[44]

Salas cites deforestation as an illustration: "the consequence of the need for more agricultural land and for firewood and charcoal as a source of energy; both are intimately linked to population growth."[45] He noted that population growth was only one factor in the deforestation process; inappropriate technologies, ill-defined property rights, poor management of resources, and poverty also contributed. Well over half of global roundwood production is now used for firewood or charcoal, compared with slightly more than 40 percent 30 years ago.

Jodha maintains that the highest risk of permanent ecological degradation from rising population pressure falls in dry tropical regions where most inhabitants still subsist on traditional agriculture. Not only is productivity low; the process of recovery from damage to natural resources is slow.[46]

Continued degradation of the soil may often be a matter of the lack of incentives to cultivators to undertake the necessary corrective action. As population densities increase, cultivated areas tend to expand outward—and upward—from more productive lowlands into the thinner soils of uplands previously utilized for pasture or covered with forest. Lower returns from these fields discourage investments in needed conservation measures, such as check dams or terracing. The situation is often exacerbated by another symptom of population pressure, land fragmentation, which renders coordinated conservation activities more difficult, even within a single watershed.

In these situations there is clearly a potential role for some catalyst to induce an effective cooperative effort. The problem in many poor countries is that the pump-priming action that might be expected through government intervention is ruled out because public funds are thinly spread to provide services and employment for expanding urban populations.

Impact of Urbanization

In many parts of the developing world, rapid urbanization has been the major social change of recent decades, with consequent changes in food consumption habits and implications for nutrition both in rural and urban areas. One notable trend, especially in Africa and Latin America, has been a declining demand for traditional cereals, roots, and tubers grown locally. Meanwhile, rice and wheat have surged in popularity as urban populations in developing countries have become more familiar with dietary patterns in the industrialized world.[47] Consumption surveys have found that in Tunisia, for example, the traditional staples of hard wheat and barley are yielding place in urban diets to industrially processed cereals, livestock products, and vegetables. In Brazil, a similar shift from the traditional diet of maize and rice is underway.

Food consumption patterns among rural populations are also changing, at least partly as a result of the processes of urbanization. Since many of those who migrate to cities in search of better employment opportunities are at the most active stage of life, populations remaining in rural areas reflect a much higher ratio of dependents—the very young and the elderly—who are directly supported by those of working age. In Africa and the Far East, this "dependency ratio" has increased two- or three-fold in rural areas. If families remaining in the villages receive cash remittances from family members working in the city, they may imitate the dietary patterns of the urban migrants, consuming more tea, bread, biscuits, and soft drinks. And if remittances are not forthcoming, these poor households, and especially children, are much more vulnerable to severe malnutrition. The incidence of severe malnutrition was 6 times higher in Zimbabwean rural families if absent workers did not send remittances home than if remittances were received.[48]

As farmers have begun to specialize in new crops in response to changes in urban food demand, the variety of food produced in local areas has declined, adversely affecting the diets of the rural poor.

World Bank/Peter Muncie

Vegetable sellers in Ubon, Thailand.

The overall economic impact of continuous out-migration from rural areas towards cities is extremely difficult to predict or evaluate. Few real-life situations prove to be as tidy as economists' computer models. In theory, siphoning off surplus labor from the countryside should increase the amount of land and capital available for each agricultural worker, consequently improving productivity and narrowing the gap between rural and urban incomes. Such assumptions, however, ignore other factors. Often it is the more productive members of the rural work force who migrate, so that the output of those left behind to tend crops and herds may actually decline on a per capita basis. Agricultural output may also be influenced if the families of the migrant workers receive regular re-

mittances from new urban sources of income.

Migration patterns in Brazil during the past four decades afford some insights into the interaction between population growth, food production, and nutrition. In the 35 years between 1950 and 1985, the proportion of Brazilians living in rural areas declined from two-thirds to one-quarter of the national population. By the 1970s, the rural population was also dropping in absolute terms, a decline that has now reached the rate of 1.3 percent per year, aided by lower fertility rates among rural women (5.8 children per woman, compared with 7.7 children per woman in 1950, and with the present urban average of 3.5).[49]

During this same period, the cultivated area in Brazil grew by more than two and one half times, from 19 million hectares in 1950 to 49 million in 1980. The availability of these ample land reserves, however, has had little effect in checking the flow of migration toward the cities. For low-income families, the high initial costs of developing virgin land has made the admittedly difficult life on the urban fringes appear as the better prospect for survival.

In Brazil, as in other Latin American countries, the trends toward industrialization and urbanization are clearly affecting fertility and population growth. However, many argue that the social costs of this process are too high. It has been estimated that in most Latin American countries marginalized workers now comprise nearly half of the total work force. Their desperate daily struggle for survival may have as much to do with modifying fertility patterns as any formal institutional arrangements.[50]

In Kenya, which has one of the world's highest rates of natural increase (births minus deaths), a remarkably different pattern of relationships in rural-urban migration has been detected. In the early 1970s, some experts concluded that the country's exceptionally rapid population growth combined with the continuing movement of large numbers of people into Nairobi would result in serious unemployment and the attendant economic and social problems. But a subsequent study, nearly a decade later, found the socioeconomic situation much better than might have been expected on the basis of the earlier forecast. Although Kenya lacked a rapidly developing industrial sector to absorb surplus rural labor, it became evident that the agrarian economy possessed a much greater capacity to provide employment than had been previously imagined. A major factor, evidently, has been the trend toward fragmentation of farm holdings. In the great majority of districts, holdings are now estimated to average less than half a hectare per person. There is evidence that more intensive use of labor on the smaller plots yields significant gains in productivity. It was found that income per worker on holdings of less than two hectares was only marginally less than that on larger holdings. And in some districts, a growing number of smallholders have shifted to production of higher value crops, such as tea and coffee, that demand labor-intensive cultivation.[51]

Access to Food

While it is generally accepted that increased income has been the dominant element in improving dietary standards, the broader concept of household viability developed by Ian Livingstone may be more useful in planning programs to aid the poor. This combines such elements as the capacity to earn particular levels of income, the production resources available to a household, diversity of income sources, and food adequacy and security. This kind of survival strategy at the micro-level helps to offset a frequently overlooked problem: the fact that incomes and levels of food production are often even more unstable at the household level than within countries. The income and spending history of 4,000 rural households surveyed in India revealed that almost half of them had experienced at least one year in which per

capita income dropped more than 30 percent below their three-year average. Yet Indian food production and aggregate income remained stable during that time period. [52]

"Problems of the rural poor . . . cannot be solved simply by augmenting agricultural production," comments Vijay S. Vyas of the World Bank. "The diversification of the rural economy is the major challenge and that would not come automatically. It is reasonable to assert that without conscious decisions to encourage non-farm activities, the large bulk of rural people cannot be provided with opportunities for gainful employment and income and access to food."[53]

The approach adopted by the governments of many developing countries—a mixture of aid, trade, and exchange rate policies designed to maintain low domestic food prices—has recently been under severe attack on the grounds that it has acted as a deterring disincentive, thus jeopardizing the development of a major sector of the economy and ultimately frustrating efforts to attain national food security.

The World Bank, however, points out that the effects of lower food prices, in the short run at least, will depend to a great extent on patterns of income and resource distribution within a country. If a large proportion of the poor are subsistence farmers, largely outside the monetized economy, changes in food prices will have little effect on food security. On the other hand, in cases where considerable surpluses of food are produced by the rural poor, policies designed to keep food prices low will undoubtedly erode longer-term food security. Where there are large populations both of urban poor and landless rural workers, lower food prices are likely to benefit overall food security. "It should not be presumed that only the urban poor benefit from lower food prices and that the rural poor are always better off with higher prices," the Bank study declares. "In fact, there is considerable evidence to the contrary."[54]

Protecting the Resource Base

Short-term vs. Long-term Tradeoffs

For more than three decades the central focus of most agricultural research has been on increasing productivity to match contemporary market requirements in terms of prices and quantities. In the industrialized world, in particular, this implied an emphasis on labor-saving, yield-increasing technologies. Mechanization, soil fertility enhanced with chemical fertilizers, and controlling diseases and pests with pesticides and pharmaceuticals provided the basis for modern agricultural industries that permitted 10 percent or less of the population to provide most of the food required by the other 90 percent. Dramatic increases in output both for units of labor and of land provided the justification for greater dependence on external inputs and for assuming the associated costs and risks. As international efforts were mounted to confront the problems of low agricultural productivity in the developing world, it was not surprising that some of these external inputs, most notably from the agro-chemical industry, should be combined with newly developed, higher-yielding varieties of major food crops to provide the package of technologies that was to be dubbed "the Green Revolution."

The success of such countries as India and Pakistan in rapidly increasing domestic food production, removing the perpetual threat of famine in the course of a few years, gave additional credibility to modern agricultural technology. It fostered the short-lived illusion that solutions to the global problems of hunger and undernutrition were at hand.

Unfortunately, the illusion was founded on several ill-considered assumptions that were quickly to be demolished by a series of natural and political events. First, the economics of modern agricul-

Severe erosion, U.S.A. **FAO/U.S. Soil Conservation Service**

ture was based on relatively low prices for the petroleum-based energy needed to produce fertilizers and to fuel tractors and irrigation pumps. With the newly discovered ability of oil-exporting nations to establish, collectively, much higher price levels, the economics of energy-intensive agriculture was drastically revised.

A second weakness inherent in the system was the failure to anticipate the environmental impact, both in the near and the longer term, of heavy reliance on chemical inputs. Beginning with Rachel Carson's seminal "Silent Spring" in 1962, a growing body of literature documented the environmental and health hazards likely to arise from agricultural systems that depended too heavily on chemical inputs. The ensuing debate most often engaged fervent defenders of the environment against equally devoted proponents of modern farming convinced of the need to maximize production in the face of expanding world population. This tended to obscure other considerations far more pertinent in influencing the decisions of producers as to the type of technology they might employ. Even while farmers in the developing world were still learning how chemical inputs could boost yields and reduce losses from diseases and pests, practitioners of high-technology agriculture were discovering that even without calculating environmental damage, cost-benefit ratios of chemical-dependent agriculture tended to become less favorable as many species of pests developed resistance to chemicals prescribed for their control.[55] Finally, reflecting some of the urgency with which the early stages of Green Revolution technology were advanced, the international research effort initially focused mainly on major crops, on more favored lands, and on the larger producers. Those dependent on rainfed agriculture rather than irrigated lands and smallholders producing traditional mixtures of crops on marginal land benefited little, if at all, from the diffusion of these new technologies.

What has evolved gradually with recognition of these facts is support in the

mainstream of the agricultural community for the development of farming systems less injurious to the environment and more concerned with the protection of the resource base for generations to come. "In my view," says Kenneth R. Farrell, former Director of the National Center for Food and Agricultural Policy at Resources for the Future, Washington, D.C., "our policies have been strong incentives to producers to employ technologies that sometimes have adverse environmental effects, the reason being that we have tried to limit production by controlling land input; farmers naturally then use more of the less scarce resources--fertilizers, pesticides, and many other kinds of chemicals. We must learn to think about technology in the broader context of the institutions, the policies, and the economic environment in which technological development occurs."[56]

More than a quarter of the United States cropland is subject to soil erosion in excess of the level that would permit present crop yields to be maintained indefinitely. If foreign demand for U.S. farm products continues and there are no major developments in technology, upwards of 50 million acres of additional cropland, much of it of marginal quality, may be brought into cultivation within the next 20 years, greatly increasing risks of widespread erosion and reducing overall agricultural productivity.[57] Water is another resource which U.S. agriculture has squandered under the influence of low energy costs and publicly-subsidized water rates. It is estimated that nearly a quarter of the groundwater used by agriculture is not replenished.

The picture is equally disturbing on a worldwide basis. In India, some 80 million hectares of cropland are seriously affected by soil erosion. Another 60 million hectares are at risk in China's loess plateau region. Ethiopia's central highland plateau has 47 million hectares seriously eroded, with nearly as much in Madagascar. The entire land surface is affected in the mountainous countries of Nepal and Peru.[58]

Environmental groups are stressing the economic side of their argument. "Far from being a merely protectionist science," writes Ignacy Sachs, Director of the International Center for Research on Development and the Environment in Paris, France, "ecology also raises a very decisive call to productivity. In fact, ecology embodies a philosophy of resource management in sharp contrast to that strict productivity which simply loots nature. ... Ecology seeks a productivity that is sustained by ecosystems. To define ecodevelopment, we start once again from a peasant rationale, but one completely open to the achievements of modern science."[59]

Unfortunately, recognition of the significance and value of many traditional peasant farming practices has been delayed by long-cherished prejudices among agricultural scientists against what was considered "primitive" technology. However, growing interest in biological approaches to agriculture have led researchers to examine many traditional practices more closely. While it is clear that there are definite agronomic limits in traditional farming systems, it is equally true that the survival of many age-old practices reflect an acquired expertise in husbanding all available resources to sustain food production in the face of hostile and unpredictable environments. As population densities have increased, traditional systems have often been pushed beyond their capacities, with disastrous results. Yet the element of permanence that was fundamental to most of these systems suggests a principle that might well be embraced by modern, "high-tech" agriculture. "The challenge for agricultural research is to improve agriculture in ways that retain the strengths of traditional agriculture while meeting the needs of changing times," declares Gerald Marten of the East-West Center in Hawaii.[60]

Prospects for Continuing Increases

The possibility that agricultural science is

indeed on the threshold of new advances that could relieve some of the pressures on food production resources receives increasing attention.[61] Some of the fields in which biotechnology applications could provide major breakthroughs in agricultural research were identified in a recent report prepared for the International Rice Research Institute (IRRI) at Los Baños in the Philippines.[62] These included:

- breeding for increased biomass;
- breeding for protein quantity and quality;
- breeding for disease resistance;
- identifying bacterial, fungal, and viral strains;
- selecting for tolerance against soil salinity, drought, aluminum toxicity;
- increasing genetic variability and inducing novel variability by producing hybrids;
- incorporating nitrogen-fixing genes into cereals;
- developing clones for propagation of horticultural and forest species, including some vegetable crop plants;
- *in vitro* fertilization of flowering and hybrid production for breeding tree crops;
- preserving germplasm of asexually-reproducing species.

One critical consideration, of course, is whether new advances in biotechnology will be readily accessible to benefit the great majority of agricultural producers. Kenneth Farrell has expressed concern that there may be proprietary rights associated with these new technologies that would restrict their distribution. In the United States, he points out, a growing proportion of total agricultural research resources are now coming from the private sector, either through research that companies conduct in their own laboratories or research they support in universities.[63]

Peter Söderbaum, who specializes in the economics of natural resources at the Swedish University of Agricultural Sciences at Uppsala, has proposed a number of what he terms "ecological imperatives for public policy" which would avoid negative long-term impacts on living conditions not only within the region immediately concerned, but externally and globally as well.[64]

FAO/Jack Ling

Terracing and irrigation for rice-growing has been underway for some 4,000 years in Luzon Province, the Philippines.

Robert Rodale, of the organic farming center and publishing house in Emmaus, Pennsylvania, contends that the rapid expansion of external inputs over the past century has unnecessarily diminished the usefulness of the internal resources of agriculture and that, on a worldwide basis, the external inputs have become too costly. As an alternative approach, he argues the case for a "regenerative" agriculture. He believes it is important to understand the natural regenerative capacity of the internal resources of agriculture and to encourage farmers to make better use of these methods.[65] Judging from surveys carried out by the Rodale Research Center, a growing number of U.S. farmers are becoming involved or interested in organic farming practices that would reduce dependence on external inputs.

Some developing countries have also demonstrated that the process of soil degradation can be reversed. Possibly the most outstanding program is in Kenya where, under a national soil conservation campaign supported by Swedish aid, about 40 percent of the country's 900,000 farms have been terraced over the past decade. Besides ending serious soil erosion, the program has brought significant economic benefits. Maize yields on terraced lands have been 60 to 100 percent higher than those grown with traditional practices. Bean yields have been 80 to 130 percent higher. Overall, it has been calculated that returns to labor on terraced land are at least 40 percent higher than for unterraced land.[66]

There are many regions of the world, however, where similar funding for soil conservation campaigns is not available and where farmers may be reluctant to undertake the required investments because they do not foresee the returns, at least in the short run, justifying the outlay. In 1981, the member governments of the Food and Agriculture Organization adopted a World Soil Charter advocating research and education programs in soil and water conservation and the provision of institutional and economic incentives for adoption of appropriate practices. But implementation faces many constraints. Effective soil conservation programs are long-term propositions, implying commitments that many governments are unable or unwilling to make in the face of competing demands on limited budget resources. Again, hierarchical government bureaucracies are often ill-adapted and their extension personnel inadequately trained for mounting the kind of campaign that will enlist the support of farmers. In many developing countries the whole concept of soil conservation is in disfavor because of previous attempts by colonial regimes to enforce conservation practices through legislation.[67]

Food Security

Chronic undernutrition and even famine are not necessarily related directly to levels of food stocks or to population densities. In fact, as Amartya Sen has pointed out, even in the 18th century such classical economists as David Ricardo and Adam Smith acknowledged that famine might occur among the poor and unemployed unable to acquire food even in the midst of an abundance of foodstuffs.[68] (Table 3 shows food prices relative to income and energy content.) Their clear message is that free market mechanisms do not respond to those unable to "signal" their need in economic

Table 3. Price of Food Relative to Income and Energy Content of Diet

1975
(United States = 100)

Countries classified by per capita income	29 developed and developing countries			17 developing countries		
	Mean income	Mean energy content of diet	Mean relative price of food	Mean income	Mean energy content of diet	Mean relative price of food
Lowest third	12	63	172	8	60	209
Middle third	39	82	137	20	70	125
Highest third	74	101	105	31	81	151

Note: The developed countries included in the analysis are: Austria, Belgium-Luxembourg, Denmark, France, Germany, Ireland, Italy, Japan, Netherlands, Spain, United Kingdom, and the United States. The developing countries included in the analysis are: Brazil, Colombia, India, Iran, Jamaica, Kenya, Korea, Malawi, Malaysia, Mexico, Pakistan, Philippines, Sri Lanka, Syria, Thailand, Uruguay, and Zambia

Source: World Bank

terms, including the need to meet nutritional requirements. Increasing food production is no guarantee that food prices will decline sufficiently to enable all or any of the destitute to enter the marketplace; it may only result in lowered incomes for food producers.

"The first cause of hunger and malnutrition is poverty." This was the resolution adopted by the International Conference on Food and Agriculture at Hot Springs, Virginia in 1943. This meeting and its remarkable document led to the founding of the UN Food and Agriculture Organization at Quebec City, Canada two years later, setting the framework for the first cooperative international effort to eliminate hunger.

International Aspects

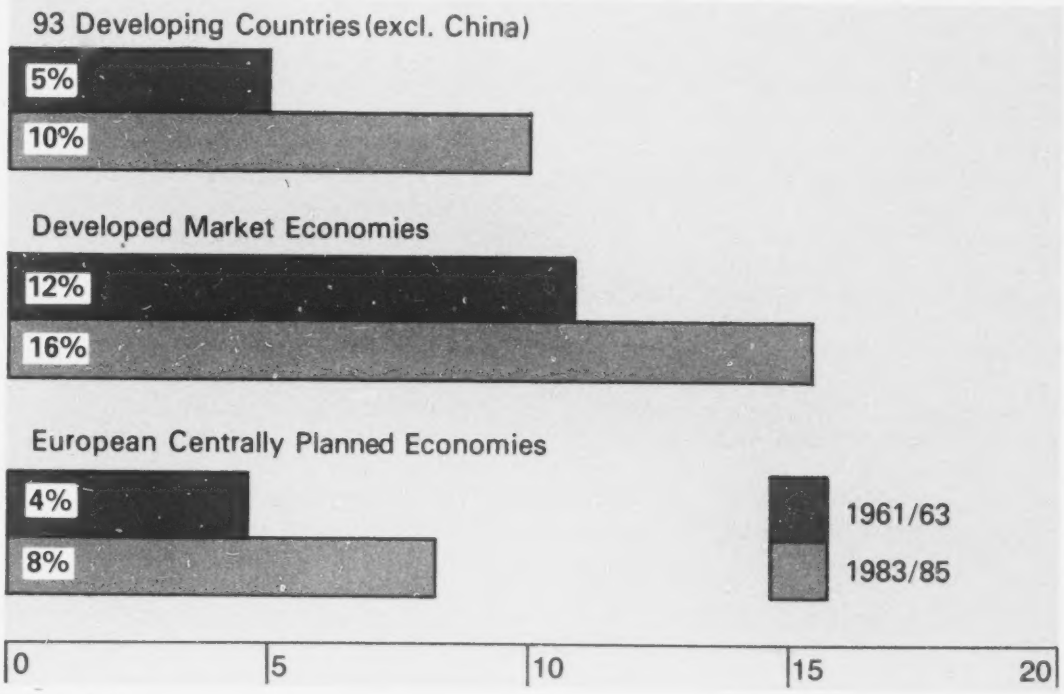
The progress that has been achieved since then, in terms of increasing food production, has been exceptional, but the fundamental goal, food security for all, has been elusive. Although major food commodities, on a global basis, have been in surplus far more often than in short supply over the intervening years, both poor countries and poor households have been reduced to accepting handouts if available, or doing without. In several cases, notably Bangladesh, Ethiopia, and the African countries of the Sahel in 1973-74 and Ethiopia and some other African countries again a decade later, widespread famine has resulted. (The Sahelian countries bordering the Sahara are Burkina Faso, Cape Verde, Chad, Gambia, Guinea-Bissau, Mali, Mauritania, Niger, and Senegal.) Despite more than four decades of international efforts, no fully effective means for ensuring food security for everyone has yet been devised.

A reading of the history of the governing bodies of FAO and related international food agencies offers some insight into the difficulties involved. From their earliest deliberations, the issue of supranational intervention in food distribution systems has posed a controversial, intractable problem. Within a year of its founding, FAO's first Director General, Sir John Boyd Orr, had proposed the establishment of a World Food Board that would set floor and ceiling prices on major food commodities, ensuring price stability by buying and selling as necessary, diverting surpluses of basic foodstuffs to the poor at subsidized prices, and establishing a world food reserve of sufficient size to compensate for crop failures in any region. It soon became evident, however, that proposals of this type were not welcomed by most member nations. Advances that were made in institutional arrangements over subsequent decades reflected more of a piecemeal approach to the resolution of global food problems.[69]

One of the first problems to be tackled in this manner was the matter of the huge commodity surpluses that began to accumulate in some of the major developed agricultural exporting nations in the early 1950s. Soon after the United States launched its bilateral food aid program in 1954, pressure began to mount for a multilateral program that would utilize donated food surpluses as support for development projects, as well as in emergencies. This eventually led to the establishment of the UN/FAO World Food Program in 1963.

Critical food shortages in the early 1970s gave impetus to renewed efforts to develop stronger international mechanisms for guaranteeing food security. The UN World Food Conference in Rome in 1974 provided a central focus not only for the immediate crisis affecting Bangladesh, Ethiopia, and the Sahel, but also for the longer-term development of agriculture and improvement of nutrition. Along with the two other preceding mega-conferences—the UN Conference on the Environment in Stockholm in 1972 and the World Population Conference in Bucharest in 1974—the Food conference helped to create a much greater awareness of the many factors influencing the course of economic development. But in terms of concrete action to enhance

Figure 8. Food Imports As Percentage of Total Food Supplies



Source: FAO

world food security, the achievements at the Conference were modest, at best. Participants did endorse an international undertaking for world food security that had been proposed by FAO's then Director General, Addeke H. Boerma, and eventually some 75 countries and the European Community agreed to adhere to its principles. This did lead to the establishment of a couple of useful new mechanisms administered by FAO: a global information system to provide earlier intelligence on potential crop failures and food shortages—satellite and computer-based—and a food security assistance scheme to aid member countries in setting up reserve food stocks. However, what was to have been the cornerstone of the undertaking, an internationally coordinated system of nationally-held food reserves, became hostage to the moribund negotiations for an International Grains Arrangement. Boerma's successor at FAO, Edouard Saouma, has endeavored to keep the food security concept alive with a proposed action plan calling for unilateral adoption of national policies on food grain stocks in accordance with the undertaking, and with a World Food Security Compact, designed to symbolize the moral—though not legal—commitment of governments, organizations, and individuals to world food security.

Thus, although certain elements have been introduced to facilitate the response of the international community to critical food shortages, the situation for low-income, food deficient countries remains essentially as it was a generation ago. In the case of critical food shortages that these countries are unable to overcome through purchases on the commercial market, they may launch an appeal for international assistance. Usually, aid has been forthcoming; often, it has been generous. But logistics and timing under these circumstances do not always per-

mit its most effective use. The ultimate result is that food-deficit countries cannot always rely with certainty on international mechanisms for effective assistance when there are critical shortfalls in their food supply. Their most obvious alternative is to fashion domestic policies that will foster self-reliance in food supplies, if not self-sufficiency, to the greatest possible extent.

In some quarters, however, there are strong doubts about the desirability or feasibility of pursuing the food self-sufficiency target to the exclusion of all other interests. The World Bank, for one, has warned that "National self-sufficiency in tradable foods is efficient only when a country has a comparative advantage in producing those foods. Moreover, food security is achieved only if all households have the ability to buy this food. Thus there is no necessary link between selfsufficiency and food security."[70] To support this contention, the Bank's study cites analyses of food security data from 50 developing countries which indicate that variations in self-sufficiency in cereals appear to have little correlation with the energy-intake levels of the national diet.

National Interventions

Regrettably, finding the right policy mix that would both provide incentives for the expansion of domestic food production and meet consumer demand for low-cost food has not proven easy for many Third World governments. To a considerable degree, they have opted for a variety of trade, aid, and exchange rate policies that have kept domestic food prices low and generally resulted in underinvestment in food production. Increasingly, such policies have come under attack, especially from international financial institutions, and a considerable number of developing countries have recently begun to introduce adjustments.

However, the difficulties that many developing countries face under present economic circumstances can be fairly gauged from the situation in some debt-burdened countries in Latin America. Under close scrutiny from the international financial institutions, many Latin American governments have been searching for ways to refinance their monumental debts, including the restriction of demand, the reduction of government intervention in the economy, the liberalization of prices, and the promotion of exports. In the view of some observers, these new policies introduced to meet conditions imposed by the international financial agencies, appear likely to result in further deterioration of conditions for the lowest income groups in the population.[71] The effect of heavy indebtedness on national food security objectives is difficult to quantify since the full impact is neither direct nor immediate. However, it seems clear that in some 60 countries, identified by the International Monetary Fund as having problems with indebtedness, growth of domestic demand for agricultural products was checked during the period 1981-85 due to increasing unemployment and declining per capita Gross National Product. Tight budgets have resulted in reduced food subsidies and drops in government expenditures for agricultural development.

Properly functioning markets—for labor and capital as well as for goods—are now regarded as a key mechanism in effecting the economic adjustments required by a rapidly growing—and shifting—population. By registering the initial impact of population growth in the form of price changes, a properly functioning market can touch off a variety of adjustments, introducing new factors of production made more valuable by population growth, reallocating resources towards the most responsive sectors, and intensifying research for substitute products and processes.[72]

But while the lack of good markets has been cited as a contributing factor in numerous food crises, most notably in African countries, they do not necessarily guarantee access to food by a household

or an individual. Transportation, storage, and distribution networks are also important. Government policies clearly play an important role. In a market economy, individuals or families, unless they have direct access to food by producing it themselves, must have enough income-generating employment to afford an adequate diet.

Legislation and policies established by national governments unquestionably have a marked influence on the household economy and on individual choices. But the development of a modern, centralized administration does not preclude the survival of traditional, less formal, institutional arrangements. Detailed research among some Sahelian societies, for instance, has discovered a remarkable degree of diversity and flexibility in the ways in which local communities respond to the stress of food scarcity. What seems clear from these findings is that no single, central policy is likely to fit conveniently with all of the wide range of responses that are evoked by crisis situations. Among the Bambara people, for example, traditional households comprising the families of several men who share a common ancestry may live and work together through several generations, providing a sense of continuity and solidarity. While migration, especially of younger men, is one response to stress, it is not suggested that deliberate policies of induced or planned migration would be likely to work with this African culture.[73]

Population Policy Initiatives

Amid the continuing concern about our planet's capability to sustain ever larger populations, it is easy to lose sight of the remarkable progress achieved within the past four decades in efforts to slow the rate of population increase. India became the first nation in the world to introduce a national family planning program, in 1950: since then, nearly two out of three developing countries, including many of the most populous, have adopted official family planning programs. It is estimated that developing countries spend about $2 billion annually on population or family planning programs, one-quarter of which comes from external assistance programs. While there are enormous variations in both the extent and effectiveness of these programs, there is clear evidence that they have, in general, brought about a reduction in total fertility rates. The number of lifetime births per woman in the developing world as a whole declined from about 6 births per woman in the late 1960s to 3.6 in the mid-1980s. There are, of course, significant regional differences in these trends. The sharpest change (a drop to 2.3) has been registered in East Asia, while there has been only a negligible decline in Africa. If China is excluded, the overall fertility level is 4.8 births per woman in developing countries as of 1987.

The declines in fertility over this period show a distinct correlation to the prevalence of contraceptive use.[74] Contraception has increased in every developing region in the past two decades, attaining a prevalence estimated at 38 percent, or slightly more than half of that of the industrialized world. But regional differences in utilization are dramatic, ranging from a low of 11 percent in Africa to a high of 69 percent in East Asia. The African countries surveyed with contraceptive prevalence rates below 20 percent have total fertility rates in excess of 6 children per woman. Analysis of the relation between contraceptive prevalence and total fertility rates demonstrates clearly that contraceptive use is the key determinant in fertility trends, although there are sufficient deviations from the norm to suggest that other determinants, both positive and negative, are also involved.

There is, of course, considerable debate as to whether the use of contraception and the consequent decline in fertility should be attributed to official family planning programs or to economic development in general. While it may be

World Bank

Family planning campaign in Kenya where a national increase of 3.9 percent annually means the population will double in 18 years.

difficult to ascribe precise weighting to the various determinants of contraceptive use, recent analysis indicates that the degree of commitment and effort shown by governments in family planning programs has significant correlation with the use of contraception regardless of the level of economic development.[75]

The development of population programs plus trends in the use of contraceptives have paralleled, and most probably reflect, changing policy approaches of many governments on population issues. This evolution is readily apparent from a comparison of the 1984 UN World Population Conference in Mexico City with the one held 10 years earlier in Bucharest. The set of 88 recommendations adopted at Mexico City gave strong support to the principle that population policies and programs are integral elements of economic development. This was in contrast to a widespread attitude among representatives of developing countries at Bucharest that, at best, family planning programs were less effective than economic development in reducing fertility, and, at worst, reflected a conspiracy of Caucasoid peoples in industrialized countries to contain the growth and influence of non-white populations.

Ironically, it was at the Mexico City conference that the United States, the major donor for external assistance to population programs, signaled a pronounced policy shift. In addition to its opposition to abortion, the U.S. argued that the rate of population growth was essentially a neutral factor in economic development and that economic growth fostered by free market policies held the greatest potential for a voluntary reduction in fertility rates. On the one hand, it has been noted that the U.S. stance may have made it easier, in a purely political sense, for some anti-American countries

to openly endorse family planning policies. On the other hand, the American refusal to support organizations or programs promoting or condoning abortion or what the U.S. perceives to be coercive population control, has had serious implications for population program funding.[76] There have been more recent indications of a resurgence of opposition to family planning policies from other sources, such as conservative Catholic groups in Latin America and the Philippines, Moslem fundamentalists in the Middle East, and nationalist groups in a number of industrialized countries. As a consequence, prospects for both external funding and domestic support for population programs, even now calculated at only about 1 percent of development assistance and national budgetary expenditures, are not improving.

In these circumstances there is a clear rationale for governments and planners to ensure that population policies are carefully integrated within the overall cultural and economic framework of their respective countries. Few societies are likely to be able to mount the type of campaign through which China, with an outlay of about $1 per person annually, has been able to increase the use of contraceptives and reduce total fertility from 6 to 3 births per woman within the space of a decade. China, it should be recognized, has a tightly-controlled economic and social structure highly susceptible to the government's goals; an intricate system for the allocation of work points that rewarded families with few dependents; and a highly organized rural society that does not permit demographic costs to be shifted outside the community, thereby increasing pressures for conformity in matters of family size.

Yet even countries confronted with major cultural barriers to family planning have shown that progress in reducing total fertility is possible. In Bangladesh, where a traditional patriarchal system has restricted the opportunities for women to have any independence and conformity to social norms implies high fertility rates, a woman's cooperative project, operating for the past 14 years, has demonstrated how activities designed to enhance economic opportunities can be linked to a family planning campaign.[77] With an outlay less than $2.5 million during the period 1980-85, the project has been able to cover more than 20 percent of the nation's 473 administrative units, reaching some 1,700 cooperatives with a total membership of 67,000. While the more immediate activities of the program concentrate on the provision of credit and training needed for self-help, income-generating activities, the longer-term objective is to bring about fundamental changes in the lives of rural women, including the concept that women can be responsible for decisions about the desirable number of children. Some indication of the impact being achieved may be taken from the results of a 1983 survey indicating that about two-thirds of all cooperative members had accepted family planning practices, compared with about half that level in family planning projects lacking an economic component, and an 11 percent level nationwide.

Even in Africa, where population programs have made the least progress and where high fertility rates and cultural barriers to family planning are reflected in rapid population increase, one country has demonstrated that family planning concepts, carefully tailored to the cultural environment, can take root in a relatively short space of time. Superficially, at least, Zimbabwe would not appear to be a likely candidate for this role. During the struggle for independence from colonial rule, the liberation movement regarded white-operated family planning services as a racist conspiracy to limit the black population. But once independence was gained, the new government was quick to recognize the close links between family planning and health and almost immediately launched an "Africanization" of the existing programs.[78] Rather than trying to introduce alien concepts of small families, the Zimbabwe program has empha-

sized the spacing of children and the health of both mother and child, concepts already inherent in African culture. Backed by a strong promotional effort through radio, schools, and exhibitions, and supported by 150 clinics or hospitals and more than 500 community workers, the program is credited with achieving the highest level of contraceptive use in Africa, 38 percent of all women of childbearing age.

Experiences such as those in Bangladesh and Zimbabwe lend credibility to the argument that population policies and programs ought to be designed within the general framework of economic and social planning, rather than viewed as an end in themselves with an isolated and independent impact on national well-being.

Improving the Bottom Line

"Reduction of fertility in and of itself will not cause poor nations to become rich," the final report of the 71st American Assembly on International Population Policy concluded. "But it can provide time and relieve pressure on societies to direct resources toward satisfying the minimum needs of a rapidly growing and economically dependent population." Lower population growth rates could ease constraints on human and capital formation, help to balance employment opportunities and the labor force, reduce pressures on public services and institutions, and foster more equitable distribution of income and opportunities.[79]

Authorities in developing countries, however, face a variety of constraints: cultural or religious sensitivities, limited resources and expertise, and a global economic climate that severely restricts their options for remedial action. Two fields in particular—the generation of employment and protection of the environment—will serve to illustrate their frustrations.

One of the major challenges confronting developing countries with high population growth rates is to find some means of shifting surplus rural labor into nonagricultural pursuits. The prospective benefits of such a shift would be to reduce per capita income disparities between agricultural and nonagricultural workers as well as to provide, in theory at least, an expanding commercial market for agricultural products. Many developing countries have sought to foster the process of industrialization by providing protective measures that have tended to favor the industrial sector at the expense of agriculture. Unfortunately, the industrialization strategies have often tended toward capital-intensive production, thus limiting opportunities for off-farm employment.

As the fragmentation of holdings and landlessness increases, especially in areas with high population densities, the creation of off-farm employment for the rural poor assumes additional urgency. Regrettably, simply creating jobs is not, in itself, a guarantee that the welfare of the rural poor will be significantly improved. The terms of employment must offer better conditions than those endured by most landless agricultural workers.

Modernization and strengthening of the agricultural sector carries potential for related industries and services that could help to absorb rural labor. Experience suggests the need for close integration of primary and secondary activities so that processing, service, and supply industries do not become primarily a conduit for siphoning rural savings into urban investment.

One expressed concern is that the divergence between developed and developing countries in population growth rates implies a corresponding dualism in achieving economic gains and limiting environmental losses. Robert Repetto argues that the richer countries, with high per capita incomes and relatively stable pressures on natural resources, will find it much easier to invoke protective policies for the envi-

ronment than developing countries where both rural and urban populations are still expanding, technical expertise is scarce, and limited public funds must cover such priority items as servicing external debt and providing urban services and employment for a growing labor force.[80]

A succinct summary of the critical nature of the responsibilities now facing governments in regard to population issues was made by Rafael Salas:

"The experience of developing countries shows that although many positive developments accompanied the march of the billions their fate would have been better if the march had been slower. With lower fertility and slower population growth, problems of the environment would certainly be easier to handle, people at large would have benefited more from new inventions, and governments would have been able to concentrate more on productive investment for development. Beyond 5 billion, the path is dictated neither by chance nor by rigid fate. One path leads toward a balance between nature and human beings which will build a future to safeguard succeeding generations. The other will lead to difficulties which might degenerate into disaster if fertility decline is too long postponed. Only a committed combination of deep personal motivation and strong political will can inform the choice."[81]

Back to Malthus

Much has been learned since Malthus' time. Agricultural production, even without the possibilities being opened up by biotechnology, can do more than increase arithmetically. The changes since his time include massive growth in both numbers of people and amount of food. Rapid population growth remains a major problem, as does hunger.

We have learned that the balance among population, food, and resources necessary for survival is a continual process, a juggling act rather than a stable equilibrium achieved once and for all. We are learning that it is not only a physical problem derived from the laws of nature, but that it is equally a social and political problem. Locusts attacking a swath of Africa can be stopped, as they were in 1986; desert areas can be made to bear fruit—the physical problems are solvable: we must learn to resolve the human problems. □

References

Population data are usually from Carl Haub and Mary Mederios Kent, *World Population Data Sheet 1988* (Washington, DC: Population Reference Bureau, Inc., April 1988).

1. Paulino, Leonardo A., *Food in the Third World: Past Trends and Projections to 2000*, Research Report 52 (Washington, DC: International Food Policy Research Institute, June 1986) p. 9.
2. Food and Agriculture Organization (FAO), *World Food Report, 1985* (Rome, Italy: FAO, 1985).
3. FAO, *The Fifth World Food Survey* (Rome, Italy: FAO, 1985) p. 6.
4. Paulino, *Food in the Third World* . . . , p. 16.
5. FAO, *The State of Food and Agriculture 1987*, mimeo for 24th Session of FAO Conference (Rome, Italy: FAO, August 1987) p. 22.
6. Paulino, *Food in the Third World* . . . , p. 14.
7. Srinivasan, T. N., "Undernutrition: Extent and Distribution of its Incidence," in *Agriculture in a Turbulent World Economy*, Proceedings of the 19th International Conference of Agricultural Economists at Malaga, Spain, August 1985. International Association of Agricultural Economists, and Institute of Agricultural Economics of Oxford University (Brookfield, VT: Gower, 1986).

8. Hussain, M.A. and Paul Lunven, "Urbanization and Hunger in the Cities," mimeo, based on a paper presented at the International Conference "Hunger in the World" in Madrid, Spain in February 1986 for publication in the United Nations University *Food and Nutrition Bulletin.*
9. Basta, Samir, "Nutrition and Health in Low Income Areas of the Third World," *Ecology of Food and Nutrition,* Vol. 6, 1977, p. 115.
10. Nelson, Janet, "Periurban Malnutrition, A Neglected Problem," *Assignment Children,* Vol. 43, July-September 1978, p. 25.
11. Hussain and Lunven, *Urbanization . . .* , p. 12.
12. Hill, Allan G., *Demographic Responses to Food Shortages in the Sahel,* ESD 801/13 (Rome, Italy: FAO, 1987) p.1.
13. Paulino, *Food in the Third World . . .* , p. 23.
14. FAO, *Agriculture: Toward 2000,* revised version (Rome, Italy: FAO, 1987).
15. Brown, Lester R. et al, *State of the World 1986,* Worldwatch Institute (New York: W. W. Norton, 1986) p. 189.
16. Walsh, John, "Second Chance for Rice Research Center," *Science,* Vol. 239, No. 4843, February 26, 1988, pp. 969-970.
17. World Bank, *Poverty and Hunger: Issues and Options for Food Security in Developing Countries* (Washington, DC: World Bank, 1986) p. 23.
18. Pingali, Prabhu L. and Hans Binswanger, "Population Density and Agricultural Intensification: A Study of the Evolution of Technologies in Tropical Agriculture," background paper cited in Committee on Population, National Research Council, *Population Growth and Economic Development* (Washington, DC: National Academy Press, 1985).
19. Johnston, Bruce F. and Peter Kilby, *Agriculture and Structural Transformation* (London, UK: Oxford University Press, 1975).
20. FAO, *World Food Report 1987* (Rome, Italy: FAO, 1987) p. 52.
21. Markham, James M., "Survival on France's Bleak but Abundant Earth," *New York Times,* February 22, 1988, p. A4.
22. Salas, Rafael M., *The State of World Population 1987* (New York: United Nations Fund for Population Activities, 1987) p. 13.
23. International Institute for Environment and Development and World Resources Institute, *World Resources 1986* (New York: Basic Books, 1986) p. 11.
24. United Nations Population Division, *The Prospects of World Urbanization, Revised as of 1984-85,* Population Studies No. 101 (New York: United Nations, 1987) pp. 6-7 ff.
25. Jodha, Narpat S., *The Depletion of Common Property Resources in India: Micro-level Evidence from Selected Areas,* ESD 801/2 (Rome, Italy: FAO, 1987) p. 3.
26. FAO, *Land, Food and People* (Rome, Italy: FAO, 1984).
27. Jodha, *Depletion . . .*
28. United Nations Population Division, *World Population Prospects, Estimates and Projections as Assessed in 1984,* Population Studies No. 98 (New York: UN, 1987), Table A-1, pp. 44-45 and Haub, Carl, "Understanding Population Projections," *Population Bulletin,* Vol. 42, No. 4 (Washington, DC: Population Reference Bureau, Inc., December 1987).
29. Frejka, Tomas, "Long Term Prospects for World Population Growth," *Population and Development Review,* Vol. 7, No. 3, September 1981.
30. Hussain and Lunven, *Urbanization . . .* , p. 4.
31. Paulino, *Food in the Third World . . .* , p. 39.
32. Repetto, Robert, "Population, Resources, Environment: An Uncertain Future," *Population Bulletin,* Vol. 42, No. 2 (Washington, DC: Population Reference Bureau, Inc , July 1987) p. 34.
33. World Bank, *Poverty and Hunger . . .* , pp. 1-3.
34. Paulino, *Food in the Third World . . .* , p. 41.
35. Higgins, Graham M., Amir Kassam, Logan Naiken, Gunther Fischer, and Mahendra Shah, *Potential Population Supporting Capacities of Lands in the Developing World* (Rome, Italy: FAO, International Institute for Applied Systems Analysis (IIASA), and the UN Fund for Population Activities, 1984).
36. FAO, *Land, Food and People . . .* , pp. 31-32.
37. Paulino, *Food in the Third World . . .* , pp. 44-45.
38. Brown, Lester R. et al, *State of the World 1987,* Worldwatch Institute (New York: W. W. Norton, 1987) p. 4.

39. Brown, Lester R. et al, *State of the World 1988*, Worldwatch Institute (New York: W.W. Norton, 1988) p. 10.
40. Repetto, *Population, Resources . . .*, pp. 14-15.
41. International Institute for Environment and Development and World Resources Institute, *World Resources 1987* (New York: Basic Books, 1987) p. 57.
42. Birowo, Archmad T. and Dibyo Prabowo, "The Pressure on Natural Resources in Indonesian Agricultural Development," in *Agriculture in a Turbulent . . .*
43. Bilsborrow, Richard E. and Paul Stupp, "Demographic Effects on Rural Development in Sub-Saharan Africa: An Assessment of the Literature and Recommendations," draft monograph for FAO and the International Labor Organization (ILO), Geneva, 1987.
44. Georgescu-Roegen, Nicholas, *The Entropy Law and the Economic Process* (Cambridge, MA: Harvard University Press, 1976).
45. Salas, *Population . . .*, p. 13.
46. Jodha, *Depletion . . .*, p. 1.
47. FAO, *Fifth World Food Survey . . .*, p. 16.
48. World Bank, *Zimbabwe: Health, Population and Nutrition Sector Review*, Report No. 4214-21M, Vol. 2, Annex 15, 1983 quoted in FAO, *Fifth World Food Survey . . .*, p. 37.
49. McNicoll, Geoffrey and Mead Cain, "Population and Rural Development: Issues and Policies," background paper, FAO, Rome, 1987.
50. Miró, Carmen A. and M.A. Gandasequi, *Population and Rural Development: Policy Lessons from Latin America*, ESD 801/15 (Rome, Italy: FAO, 1987).
51. Livingstone, Ian, *Population Growth, the "Sponge Effect" and Rural Household Viability in Eastern and Southern Africa*, ESD 801/5 (Rome, Italy: FAO, 1987).
52. World Bank, *Poverty and Hunger . . .*, p. 26.
53. Vyas, Vijay S., in *Agriculture in a Turbulent . . .*, discussion on pp. 211-212.
54. World Bank, *Poverty and Hunger . . .*, p. 31.
55. Hendry, Peter, "Who's Afraid of Advanced Technology?" *Ceres*, Vol. 3, No. 4, July-August 1970.
56. Farrell interview, *Ceres*, Vol. 18, No. 6, November-December 1985.
57. Farrell, Kenneth R. and Susan M. Capalbo, "Natural Resource and Environmental Dimensions of Agricultural Development," in *Agriculture in a Turbulent . . .*
58. *World Resources 1986*, p. 270.
59. Sachs, Ignacy, "The Strategies of Ecodevelopment," *Ceres*, Vol. 17, No. 4, July-August 1984.
60. Marten, Gerald G., "Traditional Agriculture and Agricultural Research in Southeast Asia," in *Traditional Agriculture in Southeast Asia* (Boulder, CO; Westview Press, 1986).
61. See, for instance, von Ah, Joseph, "Agricultural Biotechnology and Environment: A Strategy for the Future," *Ceres*, Vol. 19, No. 2, March-April 1986.
62. Khush, Gurdev S. and Sant S. Virmani, "Some Plant Breeding Problems Needing Biotechnology," in *Biotechnology in International Agricultural Research*, Proceedings of the Inter-Center Seminar, International Rice Research Institute (Manila, PI: IRRI, 1985).
63. Farrell, *Ceres*, Nov.-Dec. 1985.
64. Söderbaum, Peter, "Ecological Imperatives for Public Policy," *Ceres*, Vol. 15 No.2, March-April 1982.
65. Unpublished interview with Rodale, October 1985 and Brown, *State of the World 1987 . . .*, p. 143.
66. Harrison, Paul, *The Greening of Africa*, International Institute for Environment and Development (London: Paladin Books, 1987).
67. Kramer, Randall A., "An International Overview of Soil Conservation Policy," in *Agriculture in a Turbulent . . .*
68. Sen, Amartya, "Elmhirst Memorial Lecture: Food, Economics and Entitlements," at 19th International Conference of Agricultural Economists, Malaga, Spain, 1985.
69. For useful background information, see FAO, *The First Forty Years* (Rome, Italy: FAO, 1985).
70. World Bank, *Poverty and Hunger . . .*, p. 31.
71. National Academy, *Population Growth and Development . . .*
72. Miró and Gandasequi, *Latin America . . .*
73. Hill, *Demographic Responses . . .*

74. Bongaarts, John, "The Transition in Reproductive Behavior in the Third World," in Jane Menken, ed., *World Population and U.S. Policy: The Choices Ahead* (New York: W. W. Norton, 1986).
75. Lapham, Robert J. and W. Parker Mauldin, "Contraceptive Prevalence: The Influence of Organized Programs," *Studies in Family Planning*, Vol. 16, No. 3, 1985.
76. *World Resources 1986 . . .*, p. 24 and Brown, *State of the World 1988 . . .*, p. 168.
77. Bruce, Judith, "Income Generating Schemes: the Bangladesh Experience," *Populi*, Vol. 12, No. 2, 1985.
78. Harrison, *Africa . . .*, pp. 250-257.
79. See Jane Menken, ed., *World Population and U.S. Policy . . .*
80. Repetto, *Population, Resources . . ., p. 38.*
81. Salas, *Population . . .*, p. 11.

Suggested Reading

In addition to the material cited above, the following publications will be of interest for those wishing to learn more about food and population.

Brown, Lester R., *The Twenty Ninth Day*, (New York: W. W. Norton & Company, 1978).

Ghosh, Pradip, ed., *Population, Environment and Resources and Third World Development* (Westport, CT: Greenwood Press, 1984).

Lappé, Frances Moore and Joseph Collins, *Food First: Beyond the Myth of Scarcity* (Boston: Houghton Mifflin Company, 1977)

The Hunger Project, *Ending Hunger: An Idea Whose Time Has Come* (New York: Praeger, 1985).

Recent Population Bulletins and Bulletin Slides

Population Bulletin prices: single issue, $5, prepaid; bulk order prices on request to: Population Reference Bureau, Inc., Circulation Department, 777 14th Street N.W., Washington, D.C. 20005; Telephone: (202) 639-8040. **Bulletin Slides:** Sets of 35mm colored slides for figures and tables appearing in a *Population Bulletin* are available at the *additional* prices shown in parentheses.

Volume 43 (1988)

Food and Population: Beyond Five Billion, by Peter Hendry — No. 2
Demographics: People and Markets, by Thomas W. Merrick and Stephen J. Tordella — No. 1

Volume 42 (1987)

Understanding Population Projections, by Carl Haub — No. 4
Redefining Procreation: Facing the Issues, by Stephen L. Issacs and Renee J. Holt — No. 3
Population, Resources, Environment: An Uncertain Future, by Robert Repetto — No. 2
Europe's Second Demographic Transition, by Dirk J. van de Kaa
(22 slides, including map, $11.00) — No. 1

Volume 41 (1986)

Immigration to the U.S.: The Unfinished Story, by Leon F. Bouvier and Robert W. Gardner — No. 4
Population Pressures in Latin America, by Thomas W. Merrick, with PRB staff — No. 3
World Population in Transition, by Thomas W. Merrick, with PRB staff. January 1988 reprint — No. 2
Demographics and Housing in America, by George Sternlieb and James W. Hughes
(21 slides, $10.50) — No. 1

Volume 40 (1985)

Asian Americans: Growth, Change, and Diversity, by Robert W. Gardner, Bryant Robey, and Peter C. Smith — No. 4
Poverty in America: Trends and New Patterns, by William P. O'Hare. March 1987 updated reprint — No. 3
Adolescent Fertility: Worldwide Concerns, by Judith Senderowitz and John M. Paxman
(13 slides, $6.50) — No. 2
Sub-Saharan Africa: Population Pressures on Development, by Thomas J. Goliber — No. 1

Volume 39 (1984)

Understanding U.S. Fertility: Findings from the National Survey of Family Growth, Cycle III, by William F. Pratt et al.
(30 slides, $15.00) — No. 5
Delayed Childbearing in the U.S.: Facts and Fictions, by Wendy H. Baldwin and Christine Winquist Nord
(17 slides, $8.50) — No. 4
The Business of Demographics, by Cheryl Russell — No. 3
Israel's Population: The Challenge of Pluralism, by Dov Friedlander and Calvin Goldscheider
(15 slides, including map, $7.50) — No. 2
Planet Earth 1984–2034: A Demographic Vision, by Leon F. Bouvier — No. 1

Send orders with checks to: Population Reference Bureau, Inc.
Circulation Department
P.O. Box 96152
Washington, D.C. 20090-6152

Population Reference Bureau, Inc.

PRB gathers, interprets, and disseminates information on the facts and implications of national and world population trends. Founded in 1929, it is a private, nonprofit educational organization that is supported by grants and contracts, individual and corporate contributions, memberships, and sales of publications. It consults with other groups in the United States and abroad, operates information and library services, and issues the publications described on the outside back cover. PRB also assists the development of population education through formal and nonformal programs.

Officers

*Joseph L. Fisher, *Chairman of the Board*
*Thomas W. Merrick, *President*
*Frances Garcia, *Secretary of the Board*
*Bert T. Edwards, *Treasurer of the Board*

Trustees

Virginia R. Allan
Jodie T. Allen
*Michael P. Bentzen
Nancy Birdsall
*Barry C. Bishop
Ellen S. Blalock
Rodrigo Botero
*Emily DiCicco
Lenneal J. Henderson, Jr.
F. Ray Marshall
Jessica T. Mathews
Anne Firth Murray
Laura Olson
Robert Parke
Peter H. Raven
Charles S. Tidball
Alfred P. Van Huyck
Vivian H. Walton
Bennetta B. Washington
Charles F. Westoff
*Montague Yudelman

Mildred Marcy, *Chair Emerita*
Conrad Taeuber, *Chairman Emeritus and Demographic Consultant*

Advisory Committee

Samuel Baum
Calvin L. Beale
Donald J. Bogue
Lester R. Brown
Philander P. Claxton, Jr.
Caroline S. Cochran
Mercedes B. Concepcion
Douglas Ensminger
Philip M. Hauser
Carl A. Huether
Jose Ruben Jara
Sam Keeny
Richard K. Manoff
M. A. Sattar
Benjamin Viel
Sloan R. Wayland

*Members of the Executive Committee of the Board of Trustees

The Population Reference Bureau is a private, nonprofit educational organization, founded in 1929. PRB members receive more than 25 informative publications each year: four annual POPULATION BULLETINS written by recognized authorities; the lively monthly news magazine POPULATION TODAY; the annually updated WORLD POPULATION DATA SHEET and UNITED STATES POPULATION DATA SHEET wall charts; the quarterly population education newsletter INTERCHANGE, accompanied twice a year by a self-contained student reading; and POPULATION TRENDS AND PUBLIC POLICY reports on the policy implications of current demographic trends, as they appear.

PRB also publishes the POPULATION HANDBOOK, a handy reference to the basics of demography, in a standard edition (revised and updated in 1985), International editions in English and other languages, and other special publications. Write for a listing and prices of publications in print. Membership prices are listed on the inside front cover of this Bulletin.

For more information, PRB's Information Resource Center responds to population-related inquiries by mail, telephone, or in-person visit. PRB's consulting service, Decision Demographics, provides personalized, in-depth data and analyses for individual clients seeking professional interpretation of population trends.

Members of the Population Reference Bureau support an organization that is dedicated to the objective analysis and reporting of one of the world's most compelling concerns.

ISSN 0032-468X

Population Reference Bureau, Inc.
777 14th St., NW, Suite 800, Washington, DC 20005
(202) 639-8040

R8750 - 2.41 10/88

POPULATION BULLETIN
Vol. 43, No. 3, September 1988

America's Elderly

By Beth J. Soldo and Emily M. Agree

PRB *A publication of the Population Reference Bureau, Inc.*

Abstract—The older population in the United States grew twice as fast as the rest of the population in the last 20 years. This growth is expected to accelerate early in the next century as the large baby-boom cohorts move through "middle age" and become "elderly." Today, about one in eight Americans is 65 years of age or older. By 2030, one out of every four persons will be an older person.

Substantial improvements in life expectancy at all ages, particularly at extreme old age, mean that not only will there be a greater proportion of elderly in the population, but that more will be the "oldest-old," over 85. By 2050, they will be more than one-quarter of the population. As people live longer, many are active and healthy well past retirement. However, many individuals living into their 80s have to cope with chronic disabilities affecting their capacity to perform day-to-day activities. Modern medicine has made great inroads against mortality from such illnesses as heart disease and stroke, but has not eliminated all the effects of these diseases.

As the population ages, the issues of health care funding and availability, particularly long-term care, increase in importance. Contrary to widespread belief, the elderly are not abandoned by their families to nursing home care. The vast majority—95 percent—live in the community. Those needing assistance generally receive help from family and friends. This has created a tremendous demand for federal subsidies to support community-based long-term care services.

One-quarter of the federal budget is now spent on the elderly—$270 billion in 1986. Medicaid and Medicare are among the government's success stories, but these programs are threatened by their very success. Economists estimate that government expenditures are three times greater for the elderly than for children, raising the issue of "intergenerational equity"—how to balance the amount of care society provides to those who have already contributed with what is provided to those who will contribute in the future. The view that the old and young simply compete for fixed resources is misleading. It ignores the interdependence among generations, and the burdens and benefits of intergenerational transfers at all stages of the life course.

Production Assistant: Tracey A. Smith
Production Intern: Janette Burton

Graphics: Thomas F. Sakowski

The *Population Bulletin* is published four times a year and is distributed along with the other publications listed on the back cover to members of the Population Reference Bureau. If you would like to order additional copies of this *Bulletin* or join PRB, contact the Population Reference Bureau, Inc., Circulation Department, 777 14th Street, N.W., Washington, D.C. 20005; telephone: (202) 639-8040. Visa and MasterCard accepted. Annual PRB membership rates *inside the United States:* individuals, $40; educators, $28; students, $20; libraries/non-profit organizations, $50; other organizations, $250. *Outside the United States:* individuals, $50; educators, $35; students, $25; libraries/non-profit organizations, $65; other organizations, $315.

For information on other *Population Bulletins* and *Bulletin Slides*, see page 52.

The suggested citation, if you quote from this publication, is: Beth J. Soldo and Emily M. Agree, "America's Elderly," *Population Bulletin*, Vol. 43, No. 3 (Washington, D.C.: Population Reference Bureau, Inc., September 1988). For permission to reproduce substantial portions from the *Population Bulletin*, write Population Reference Bureau, Inc., Permissions, 777 14th Street N.W., Washington, D.C. 20005.

© 1988, by the Population Reference Bureau, Inc.

The *Population Bulletin* is indexed in *GEO Abstracts, PAIS Bulletin, Population Index, Social Sciences Index,* and *Social Sciences Citation Index.* It is included in the coverage of *Current Contents/Social and Behavioral Sciences,* Biosciences Information Service of Biological Abstracts and the CICRED/UNFPA *Review of Population Reviews,* and is available in microform from University Microfilms Inc., 300 North Zeeb, Ann Arbor, MI 48106. Selected *Bulletins* are also included in the coverage of and available on microfiche through ERIC Systems.

America's Elderly

By Beth J. Soldo and Emily M. Agree

Page

Introduction 5
Defining—and Redefining—Old Age 6
Demography of the Elderly 6
Population Aging 7
  Size of the Older Population 7
  Proportion of Total Elderly 10
The Older Population 12
  Sex 12
  Age 13
  Race and Ethnicity 14
  Geographic Distribution 15
Survivorship 17
  Changes in Mortality 17
  Changes in Causes of Death 18
  Illness and Disability 19
  Approaches to Understanding Disease, Disability, and Mortality 20
Quality of Life 23
  Education 23
  Employment 23
  Income 26
  Expenditures 27
  Housing 28
  Marital Status and Living Arrangements 29
  Family Status and Informal Care 30
Government Help for the Elderly 32
  Recent Legislation 34
  Evaluating the Public Sector Response 35
  Challenges of Long-Term Care 35
  Intergenerational Equity 37
  Financing Long-term Care 39
Conclusion 42

References 43
Further Reading 46
Further Discussion Points 47

Box
1. Aging in International Perspective 48

Tables
1. Total U.S. Population and Population 65 and Over: 1900-1980, Projections 1987-2050 .. 7
2. Percent of Population 65 and Over and Median Age of U.S. Population: 1900-1980, Projections 1987-2050 9
3. Age Dependency Ratio: Estimates 1960-1985, Projections 1990-2050 12
4. Number of Elderly 65 and Over, 85 and Over, by Sex and the Sex Ratio: 1960-1985, Projections 1990-2050 13
5. Percent Change in Regional Population of All Ages and Those 65 and Over: 1980 to 1986 16
6. Life Expectancy at Birth and at Age 65, by Race and Sex: 1900, 1950, 1975, 1985 17
7. Life Expectancy at Ages 65 and 85 by Sex: Projections 1990, 2000, 2020, 2040 17
8. Average Annual Percent Change in Death Rates of Elderly by Cause, Age, and Sex: 1950-1984 18

9. Selected Chronic Conditions of the Population 65 and Over by Sex, 1986 19
10. Percent of Elderly with Number of Personal Care Activities Reported Difficult, 1984 20
11. Marital Status of Population 65 and Over by Sex, 1987 29
12. Living Arrangements of Population 65 and Over by Sex, 1987 30
13. Illustrations of Intergenerational Transfers 40

Figures

1. Older Population as Percent of Total U.S. Population: 1950-2050 8
2. Age and Sex Composition of the U.S. Population: 1960, 1985, 2010, 2030 10
3. Projected Growth in the Older Population: 1980-2050 14
4. Change in Share of Population 65 and Over by Region, 1980-1986 15
5. Mortality (Observed), Morbidity (Hypothetical), and Disability (Hypothetical) Survival Curves for U.S. Females, 1980 21
6. Dissatisfaction with Life by Age and Living Arrangement 24
7. Labor Force Participation: 1950-1985 25
8. Median Income of Households by Age of Householder and Work Status, 1986 27
9. Sources of Income of Older U.S. Population, 1986 27
10. Distribution of Annual Expenditures by Age, 1985 28
11. Percent of Caregiving Days by Relationship of the Caregiver 31
12. Federal Dollar Expenditures for Senior Citizens, 1986 34
13. Distribution of Children and Elderly: 1900-2050 38

POPULATION BULLETIN
Vol. 43, No. 3, September 1988

Clockwise: **ACTION/Biddle, AARP, and ACTION/Creal.**

State Rankings by Persons 65 and Over, by Number, Percent of Population, and Percent Change 1980-1986, 1986

	Number of Persons 65 and Over		Persons 65 and Over as Percent of State Population			Percent Change in Number 1980-1986		
Rank	State	(000s)	Rank	State	Percent	Rank	State	Percent
1	California	2,848	1	Florida	17.7	1	Alaska	55.3
2	New York	2,283	2	Pennsylvania	14.6	2	Nevada	51.3
3	Florida	2,071	3	Rhode Island	14.6	3	Hawaii	35.8
4	Pennsylvania	1,736	4	Iowa	14.5	4	Arizona	33.2
5	Texas	1,583	5	Arkansas	14.5	5	New Mexico	24.5
6	Illinois	1,386	6	South Dakota	13.9	6	South Carolina	23.6
7	Ohio	1,320	7	Missouri	13.7	7	Florida	22.7
8	Michigan	1,039	8	West Virginia	13.6	8	Delaware	22.3
9	New Jersey	981	9	Nebraska	13.6	9	Utah	22.2
10	Massachusetts	794	10	Massachusetts	13.6	10	North Carolina	21.1
11	North Carolina	731	11	Oregon	13.4	11	Washington	20.5
12	Missouri	694	12	Kansas	13.4	12	Virginia	19.9
13	Indiana	657	13	Maine	13.3	13	Idaho	19.7
14	Wisconsin	624	14	Connecticut	13.3	14	Maryland	19.6
15	Georgia	608	15	Wisconsin	13.0	15	Oregon	19.3
16	Virginia	606	16	North Dakota	13.0	16	Colorado	18.9
17	Tennessee	590	17	New Jersey	12.9	17	California	18.0
18	Minnesota	526	18	New York	12.8	18	Georgia	17.7
19	Washington	520	19	Minnesota	12.5	19	Montana	17.3
20	Alabama	496	20	Oklahoma	12.4	20	Connecticut	15.8
21	Maryland	473	21	Arizona	12.3	21	Texas	15.5
22	Louisiana	454	22	Ohio	12.3	22	New Hampshire	15.2
23	Kentucky	449	23	Tennessee	12.3	23	Wyoming	14.5
24	Connecticut	423	24	Alabama	12.2	24	New Jersey	14.1
25	Iowa	414	25	Dist. of Columbia	12.2	25	Tennessee	13.9
26	Oklahoma	411	26	Montana	12.1	26	Michigan	13.9
27	Arizona	409	27	Kentucky	12.0	27	Pennsylvania	13.4
28	Oregon	362	28	Illinois	12.0	28	Ohio	12.9
29	South Carolina	355	29	Mississippi	12.0	29	Alabama	12.8
30	Arkansas	344	30	Indiana	11.9	30	Louisiana	12.3
31	Kansas	330	31	Vermont	11.9	31	Indiana	12.1
32	Mississippi	314	32	Washington	11.7	32	Rhode Island	11.8
33	Colorado	294	33	New Hampshire	11.6	33	Maine	10.8
34	West Virginia	261	34	North Carolina	11.5	34	Wisconsin	10.7
35	Nebraska	217	35	Delaware	11.4	35	Vermont	10.6
36	Maine	156	36	Michigan	11.4	36	Arkansas	10.0
37	New Mexico	144	37	Idaho	11.2	37	Illinois	9.8
38	Rhode Island	142	38	Maryland	10.6	38	West Virginia	9.8
39	Utah	133	39	California	10.6	39	Minnesota	9.7
40	New Hampshire	119	40	South Carolina	10.5	40	North Dakota	9.6
41	Idaho	112	41	Virginia	10.5	41	Kentucky	9.5
42	Hawaii	103	42	Nevada	10.3	42	Oklahoma	9.3
43	Nevada	99	43	Louisiana	10.1	43	Massachusetts	9.2
44	Montana	99	44	Georgia	10.0	44	Mississippi	8.7
45	South Dakota	99	45	New Mexico	9.8	45	South Dakota	8.4
46	North Dakota	88	46	Hawaii	9.7	46	Kansas	7.7
47	Dist. of Columbia	77	47	Texas	9.5	47	Missouri	7.0
48	Delaware	72	48	Colorado	9.0	48	Iowa	6.9
49	Vermont	64	49	Wyoming	8.4	49	Nebraska	5.7
50	Wyoming	43	50	Utah	8.0	50	New York	5.7
51	Alaska	18	51	Alaska	3.4	51	Dist. of Columbia	3.1

Source: *Aging America, Trends and Projections, 1987-88 Edition* prepared by the U.S. Senate Special Committee on Aging in conjunction with the American Association of Retired People, the Federal Council on the Aging, and the U.S. Administration on Aging, Table 1-7, pp. 31-2.

America's Elderly

By **Beth J. Soldo** and **Emily M. Agree**

Beth J. Soldo is Chair of the Department of Demography at Georgetown University, Washington, D.C.. She is also Director of the Center for Population Research and a Senior Research Fellow in the Kennedy Institute of Ethics. Holding a Ph.D. in sociology from Duke University, North Carolina, she has served as a consultant to the National Institute on Aging, the Senate Select Committee on Aging, the American Association of Retired Persons, and the Health Care Financing Administration, among other organizations. Dr. Soldo has directed studies on the policy implications of aging populations; the housing, family structure, living arrangements, and health status of the elderly; and various aspects of long-term care.

Emily M. Agree is currently a Senior Research Associate at the Center for Population Research at Georgetown University, focusing on the nature of long-term care decisionmaking by older persons and their families. She earned the M.A. in demography from Georgetown and has been a consultant to the U.S. General Accounting Office on the status of elderly persons in the U.S. As of September 1988, Ms. Agree will be affiliated with the Department of Sociology at Duke University, North Carolina.

The authors acknowledge with gratitude the research assistance provided by Machiko Yanagishita of the Population Reference Bureau, Inc., and the many forms of support and assistance from Marie Carr and Michelle Zentis of the Department of Demography, Georgetown University.

America is growing older. The aging of individuals is imprinted on the structure of our society. Indeed, the characteristics of our nation's elders tell the story both of their own lives and of our nation's recent history. Since aging is both an individual and a societal process, the aging of populations, like that of individuals, is inevitable in the long run.[1]

There are some 30 million persons aged 65 and older in the United States today, over 12 percent of the total population. This is a 60 percent increase from the number in 1960. Only 50 years ago, there were 9 million older persons, 7 percent of all Americans. In 1900, one of every ten Americans was 55 and older and one in twenty-five was 65 and over: In 1987, one in five was 55 and over and one of every eight was 65 and older. The share of total population of those 65 and over is expected to increase to 21 percent—almost one-quarter of the entire population—by the year 2030. This age group is increasing more rapidly than the rest of the population, growing twice as fast over the past 20 years.

The older population itself also is aging at dramatic rates. By the year 2000, 45 percent of the older population will be 75 and older. Those 85 and over are one of the fastest growing age groups in the U.S. Even the number of centenarians is increasing rapidly; there were an estimated 26 thousand 100-and plus-year-olds in 1980, and the number is projected to increase in coming decades.

There is no historical precedent for the aging of our population. We are in the midst of a new social phenomenon. Since the improvements in life expectancy have been accompanied by low fertility, the entire population is getting older; the median age rose from 23 years in 1900 to 32 years in 1987, and is projected to be over 40 by the year 2030. We cannot foresee all the repercussions, implications, or social changes stemming from the presence of so many older per-

sons and the aging of the society. However, we can forecast certain elements of this change, knowing, for example, that the 75 million baby boomers will begin to reach their 60s after the turn of the century.

A quarter of the federal budget is now spent on America's elderly—$270 billion in Fiscal Year 1986. Nonetheless, nearly 16 percent of the elderly live near or below poverty level. In 1986 an older person was nearly twice as likely as a younger adult to live in poverty. And although elderly Americans are healthier than ever before, many of those over 75 need chronic health care.

This *Bulletin* describes the older population, their socioeconomic and health status, and examines the problems and opportunities created by the burgeoning population of older people and the aging of society.

Defining—and Redefining—Old Age

Each of us is inexorably aging from the moment of our birth. But individuals show tremendous variation in this process, as each person's genetic heritage, environment, personality, and experiences differ. There is also wide variety in how different cultures mark and treat the basic divisions of life: childhood, adulthood, and old age.

There is also the fact that until recently few people lived long lives; one could be "old" early on in ancient Greece or Rome when an average life expectancy was 20 years, probably around 30 years in medieval Europe, and 40 years in the America of 1850. And it is only very recently in the history of humanity that "aged" did not necessarily fit the description of "sans teeth, sans eyes, sans taste, sans everything" given by Shakespeare in *As You Like It*, written in 1600.

Society sets the dividing points in the life cycle, often marking the divisions by *rites de passage* or legislation. These definitions change as circumstances change. For instance, the 26th Amendment to the U.S. Constitution in 1971 lowered the legal voting age to 18 and 1983 legislation decreed that full Social Security benefits would be available at age 67 after the turn of the century, rather than 65 as at present.

Chronological age, the physical passage of time since birth, is the easiest method of definition. Because individuals differ markedly, chronological age is not synonymous with functional age—an individual's physical, intellectual, and social capacities and accomplishments. While many argue that functional age should be used to mark "old age," this is by definition an individual measure and society needs a more general standard. In our time, the dividing line is 65. At this age, an individual is eligible for a full retirement benefit from Social Security, Medicare, and such "perks" as reduced air fare and discounts in many stores. This *Bulletin* defines the elderly as those aged 65 and older.

Yet it is important to recognize that the older population is an extremely diverse group, spanning nearly a 40-year age spread and including individuals with very different life histories. A person 100 years old in 1988 has witnessed horse-and-buggy travel as well as moonwalks. We therefore distinguish between the "young-old" (65-74) and the "older-old" whenever possible.

Demography of the Elderly

At any point in time, the older population can be identified in terms of specific birth cohorts* that span the older age groups. Cohorts born in 1925 or earlier will define the elderly population in 1990. Many survived World War I and the flu pandemic

*A birth cohort consists of all the persons born within a specific time interval, e.g., a year or a period of five or ten years.

of 1919-20; all lived through the Depression of the 1930s and World War II. It is not simply exposure to these major events that shaped the life history of those who are now elderly; it is also how old they were when these events happened. Cohorts who experienced the Depression during their childbearing years, for example, have the lowest completed fertility of any observed so far this century. Those born roughly between 1900 and 1910 and surviving into old age, have smaller families on average to rely on than those born only 10 to 20 years earlier or later. Such unique life histories shape the old age experience of the cohorts now 65 years of age and older and help to differentiate them from those who will be old 10, 20, or 40 years from now.

Not only age, but other characteristics such as gender and race have influenced the life experiences of the older population. Historic discrimination in education, housing, and job opportunities for both minorities and women have uniquely affected each cohort as it ages, both individually and in overall composition.

The following subsections outline the demographic characteristics of today's elderly, and set the stage for considering the health and socioeconomic changes associated with old age and their implications for policy and planning.

Population Aging

Initially, it is useful to consider two basic demographic features of an older population: growth in the absolute size of the elderly population and changes in the relative number of older persons.

Size of the Older Population

The size of the older population in the U.S. has grown steadily—and dramatically—over the 20th century (see Table 1). In 1900, only 3 million people in a total population of 76 million were 65

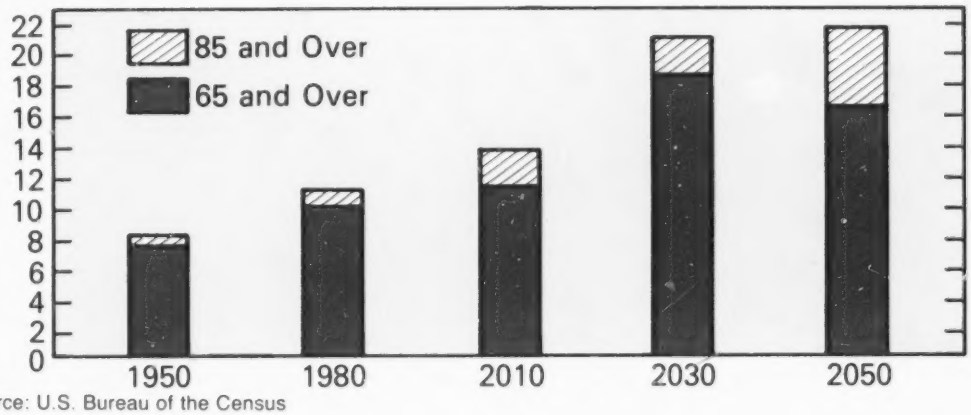
Table 1. Total U.S. Population and Population 65 and Over: 1900-1980, Projections 1987-2050

	Total Population		Population 65 and Over	
Year	Number (in thousands)	Percent Increase From Preceding Decade	Number (in thousands)	Percent Increase From Preceding Decade
1900	75,994	20.7	3,099	—
1910	91,972	21.0	3,986	28.6
1920	105,711	14.9	4,929	23.7
1930	122,755	16.1	6,705	36.0
1940	131,669	7.3	9,031	34.7
1950	152,271	15.6	12,397	37.3
1960*	180,671	18.7	16,675	34.5
1970	205,052	13.5	20,107	20.6
1980	226,546	10.5	25,549	27.1
Projections				
1987	243,400		29,835	
1990	249,051	9.9	31,697	24.1
2000	267,767	7.5	34,921	10.2
2010	283,238	5.8	39,195	12.2
2020	296,597	4.7	51,422	31.2
2030	304,807	2.8	64,581	25.6
2040	308,559	1.2	66,988	3.7
2050	309,488	0.3	67,411	0.6

*First year for which figures include Alaska and Hawaii.

Source: U.S. Bureau of the Census

Figure 1. Older Population as Percent of Total U.S. Population: 1950-2050



Source: U.S. Bureau of the Census

years of age and over. Yet by mid-century, older men and women had more than quadrupled their numbers to slightly over 12 million. Since then, the addition of an average 452,000 older persons annually has meant that the older population more than doubled. This eightfold increase since the turn of the century has far outpaced the tripling of the overall population to 240 million during the same period.

All of the basic demographic processes—fertility, mortality, and migration—contributed, but not to the same degree, to this rapid growth in the number of older Americans.

The maximum size of the older population at any point in time is largely determined by the number of births 65 or more years earlier. The large numbers today come primarily from the high fertility of the late 19th and early 20th centuries. Over the next 30 years, this growth will decelerate as the smaller cohorts born during the Depression era reach age 65. For several decades thereafter (2010-2030), however, the post-World War II baby boom will swell the ranks of the elderly. During these years, it is reasonable to anticipate an average increase of some 1.3 million older persons each year. Shortly after this period of dramatic growth, the rate of increase will decline sharply as the so-called "baby-bust" cohorts born during the mid-1960s and 1970s cross the threshold into old age. Beginning about 2045, a secondary wave of the children of the baby boom will again launch another period of growth in the size of the older population. Hence, an unevenly paced growth rate will be a hallmark of population aging in the late 2Oth and early 21st centuries as the number of elderly increases from 26 million in 1980 to 51.4 million in 2020 and then to 67.4 million in 2050.

Second in importance in explaining the extraordinary expansion of the older population is the decline in mortality. Between 1900 and 1954, the risk of infant and childhood death dropped rapidly, due largely to improved sanitation and the introduction of antibiotics and vaccines.[2] All those born during this century have benefited from the reduced chances of dying from infectious disease and more of each cohort have thus lived to reach age 65. Only four out of ten of those born in 1900 could expect to survive to age 65; today almost eight out of ten newborns are expected to attain this milestone.

The size of the current older population also echoes the unique historical imprint

of the large pre-World War I immigration waves to America. These immigrants, mostly young adults from European countries, swelled the numbers in their respective, already large, native-born age groups; those still surviving are now in their early 90s. The indirect effect of turn-of-the-century immigration is through the high fertility of these immigrants, whose U.S.-born children now themselves are numbered among the elderly.

The ranks of the elderly will continue to increase at least through the year 2050, but at varying rates. The U.S. Bureau of the Census projects that between 1980 and 1990 the elderly population will have increased 23 percent to nearly 31 million—a smaller gain than the 28 percent experienced during the 1970s. Between 1990 and 2010 the effect of the small Depression era cohorts will slow the growth of the older population to a modest 10 percent in the 1990s and 12 percent in the first decade of the 21st century.

This translates into almost 35 million elderly persons in 2000 and over 39 million in 2010. After 2010 the aging of the post-World War II baby-boom generation will set off a "senior boom," resulting in 51 million elderly by 2020 and almost 65 million in 2030—an increase of 66 percent in only two decades. Much of the current concern over an aging society simply anticipates this abrupt surge in the number of persons beginning some 25 years from now. After 2030, the growth of the older population is expected to slow considerably as the smaller numbers born during the later 1960s and the 1970s join the older population. After 2045, there will be a secondary wave as the offspring of the baby-boom generation age. As these future elderly are already alive today, anticipating the size of the older population through this period involves projecting only the future course of mortality. These projections provide a fairly reasonable estimate of the overall numbers of older people in the near future.

Table 2. Percent of Population 65 and Over and Median Age of U.S. Population: 1900-1980, Projections 1987-2050

Year	Percent of Population 65 and Over Estimates	Median Age of U.S. Population
1900	4.1	22.9
1910	4.3	24.1
1920	4.7	25.3
1930	5.5	26.5
1940	6.9	29.0
1950	8.1	30.2
1960	9.2	29.4
1970	9.8	27.9
1980	11.3	30.0
Projections*		
1987	12.3	32.1
1990	12.7 (12.4 – 12.9)	33.0 (32.6 – 33.2)
2000	13.0 (12.3 – 13.8)	36.3 (35.3 – 37.3)
2010	13.8 (12.4 – 15.3)	38.5 (36.0 – 40.7)
2020	17.3 (14.8 – 19.7)	39.3 (35.7 – 42.9)
2030	21.2 (17.3 – 25.4)	40.8 (36.0 – 45.5)
2040	21.7 (16.7 – 27.5)	41.6 (35.4 – 47.6)
2050	21.8 (15.8 – 29.2)	41.6 (35.2 – 48.5)

*Main projection uses middle-level fertility, mortality, and immigration rates. Range in parentheses go from low to high levels to illustrate the largest possible spread.

Source: U.S. Bureau of the Census

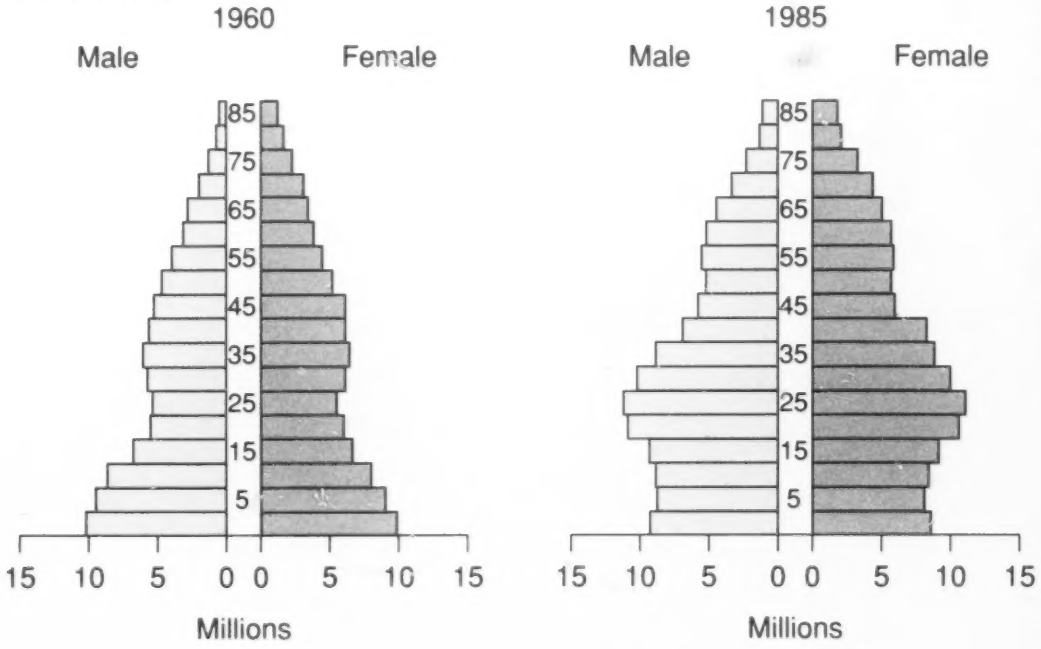
Proportion of Total Elderly

Demographically speaking, the aging of our population refers to the increasing proportion of older people rather than the spectacular gain in absolute numbers. A convenient way to track the aging of a population is to compare the percentage of elderly in the population over time. This is shown for the U.S. for the period 1900 to 2050 in Table 2.

At the turn of the century America was a demographically youthful country. Only about 4 percent of the total population was 65 or over. By 1950, the United States had what is considered to be a "mature" age structure with an older population of 8.1 percent. In 1980, when one in nine Americans was elderly (11.3 percent), the U.S. age structure was already considered to be "aged." The U.S., however, is far from being the "oldest" of the developed countries. Sweden, Norway, Denmark, the United Kingdom, and West Germany each had over 15 percent of their populations aged 65 and over in 1988.[3]

Increases in the relative number of older people also raises the median age of a population, as shown in Table 2. The rise in median age beginning in 1980 reflects not only the increased proportion of older persons, but also the passage of the baby-boom cohorts into middle age. It is important to realize that changes in the proportion of the elderly (unlike changes in absolute numbers) are affected by variations in the numbers of people in other age categories. Basically, an increase in the proportion of the population 65 and over is due more to declining fertility than to lower death rates. The

Figure 2. Age and Sex Composition of the U.S. Population: 1960, 1985, 2010, 2030



Source: U.S. Bureau of the Census

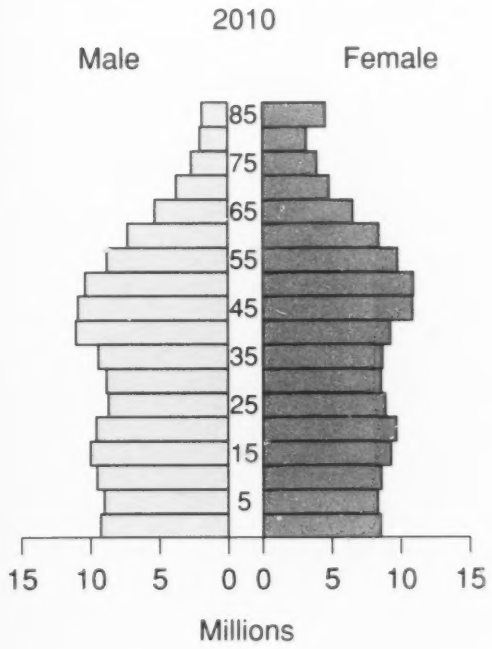
drop in fertility over the last 15 to 20 years in the U.S. reduces the proportion of young persons and thus increases the proportion of adults and older persons in the population.

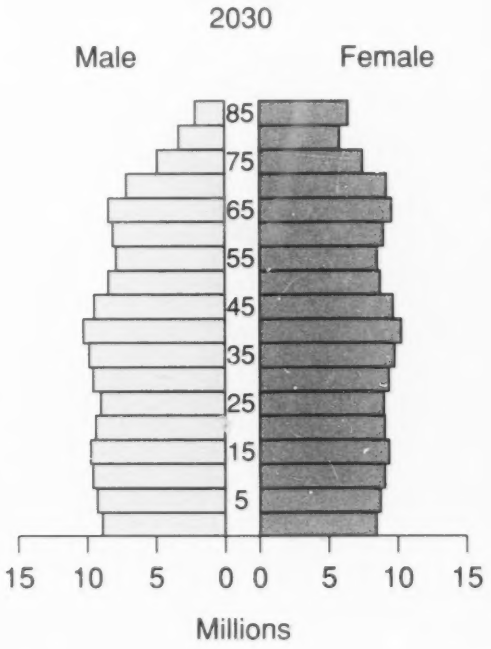
The aging of the U.S. population is easily seen in the population pyramids of Figure 2, showing the percentage distribution of the population by age and sex and the effect of different cohorts as they pass through their life cycles. The baby boomers of the 1950s significantly broaden the base of the 1960 pyramid. The small size of the cohorts born during the last 20 years, coupled with the aging of the large birth cohort of 1900-1910, has again stimulated rapid aging of the U.S. population as seen in the widened apex of the pyramid for 1985.

If the U.S. were to witness another baby-boom phenomenon, the base of the population pyramid would widen and the *proportion* of elderly would actually decline over time. Although there is no reason to anticipate a sharp upsurge in the birth rate, it is useful to consider a range of outcomes. The U.S. Bureau of the Census prepares 30 projection series with broad ranges of assumptions about fertility, mortality, and immigration patterns.

Assuming modest change, the relative number of older people would continue its steady upward course over time. The greatest increases occur between 2010 and 2020 when the projected proportion of elderly increases from 13.8 to 17.3 percent as the members of the baby boom turn 65. Low-level assumptions would imply more modest growth, with the relative number of elderly increasing from 12.4 percent in 1990 to but 15.8 percent in 2050. However, there would be an increase from 12.9 percent to 29.2 percent if fertility, mortality, and immigration were at comparatively high levels.

The 1950's cohorts are so large, under any set of assumptions, that the proportion of elderly will burgeon between





2010 and 2020. Twenty years later, the relative number of persons aged 85 and over will evidence a similar bulge. By 2050, more than one in four elderly persons will be among the oldest-old, 85 and older.

Increasing *numbers* of older persons have increased demand for the goods and services that the aged are prone to consume. Increasing *proportions* of elderly point to the difficulties that could be encountered in absorbing the costs of meeting this escalating demand. Many of the programs that directly benefit elders are structured as intergenerational transfers; the contributions of the younger, working cohorts are expected to maintain older "dependent" generations. The combined effects of recent low fertility and increased numbers of elderly will result in fewer persons of working age relative to the older population. Aged dependency ratios (see Table 3) are one way of estimating society's capacity to maintain the quality of life of older persons.

In 1985, there were about 19 persons of retirement age for every 100 working-age persons. This ratio is projected to increase to 21 by the year 2000, and by 2050, the aged dependency ratio will more than double from its 1985 level to 38. This increase implies an increasing financial "burden" on workers in the next century under the current system.

These ratios probably err on the optimistic side since increased education has delayed entry into the labor force and more people have been taking earlier retirement. Nor do the ratios shown reflect the disproportionate claim the oldest-old—those 85 and over—make on our collective resources because of their health care needs.

An increase in the "full benefit" retirement age from 65 to 67 will be phased in gradually during the period 2000 to 2022 under 1983 legislation. This will reduce the ratio of retirees to workers when large baby-boom cohorts reach retirement age. Nonetheless, in order to stabilize the age dependency ratio at its 1985 level of about 20, the ratio would need to be calculated in 2050 using age 74 as the cutoff for eligibility, according to the Office of the Actuary of the Social Security Administration.

The Older Population

In assessing the implications of aging, it is important to consider the changing characteristics of the older population as well as their numbers. The data presented in the following section will clarify some of the changes influencing planning for the needs of tomorrow's elders.

Sex: The older population is predominantly female, especially at the oldest ages. "The problems of old age in America are largely the problems of women," says Dr. Robert Butler, former director of the National Institute on Aging.[4] Six out of every ten older Americans are women. This is a relatively recent situation. As recently as 50 years ago, there were equal numbers of older men and women. Women began surviving

Table 3. Age Dependency Ratio: Estimates 1960-1985, Projections 1990-2050

Year	Age Dependency Ratio*	Index of Relative Change (1980 = 100)
1960	16.8	90
1970	17.6	95
1980	18.6	100
1985	19.3	104
Projections		
1990	19.5	105
2000	21.1	113
2010	21.9	118
2020	28.7	155
2030	37.0	199
2040	37.9	204
2050	38.0	205

*Number of persons ages 65 and over per 100 persons ages 18-64

Source: U.S. Bureau of the Census

Table 4. Number of Elderly 65 and Over, 85 and Over, by Sex and the Sex Ratio: 1960-1985, Projections 1990-2050

Year	65 and over			85 and over		
	Male	Female	Sex Ratio*	Male	Female	Sex Ratio*
1960	7,525	9,120	121	365	575	158
1970	8,441	11,716	139	556	1,055	190
1980	10,366	15,338	148	688	1,582	230
1985	11,535	17,000	147	773	1,934	250
Projections**						
1990	12,638	19,059	151	919	2,393	260
2000	13,763	21,159	154	1,350	3,576	265
2010	15,609	23,588	151	1,791	4,761	266
2020	21,211	30,211	142	1,942	5,139	265
2030	26,934	37,645	140	2,471	6,140	248
2040	27,420	39,985	146	3,804	9,030	237
2050	27,477	39,934	145	4,786	11,247	235

*Number of females per 100 males

**Projections assume middle level fertility (ultimate number of births per woman of 1.9; mortality (ultimate life expectancy in 2080 of 80.1 years); and net immigration (450,000 per year).

Source: U.S. Bureau of the Census

longer than men as pregnancy- and childbirth-related deaths and mortality from infectious diseases dropped rapidly after 1930.

Table 4 shows that over time, the 65-and-over sex ratio (the number of females per 100 males) will change little from its current base of 147. The relative gap in the number of women 85 years old and over per 100 comparably-aged men will widen, however. It peaks in 2010 at 266 when women will comprise more than 72 percent of all the oldest-old population.

The sex imbalance in the older population reflects higher male mortality. This mortality differential also accounts for the faster growth of the older female population. Between 1980 and 1985, men 65 and over increased by just over 50 percent while the number of women increased by more than 86 percent. The excess of male mortality at the oldest ages has also left its mark on the age composition of the older male and female populations. Men 85 years of age and over account for only 7 percent of the elderly male population, but among women 65 and over, those 85 and over make up over 11 percent.

Since at least 1970, the difference in male-female life expectancy has increased to about 7.8 years, but the future course of this difference is subject to much debate. Some argue that the differential will disappear as life expectancy approaches the upper limit of a natural life span. Others anticipate a difference of as much as 10 to 12 years by the turn of the century.[5] The projections shown in Table 4 are based on the assumption of a gradual widening to an 8.5 year difference in male-female life expectancy in 2080.[6]

Sex differentials in survivorship rates have great importance because older men and women have quite different social and economic resources available. In general, older women have fewer financial assets and, because they typically outlive their spouses, are more dependent on adult children and formal health care services (including nursing homes) to meet their needs.

Age: The older population is itself aging substantially. The oldest-old, those 85 years of age and over, are the fastest growing age group within our entire population. Moreover, since 1940 the oldest-

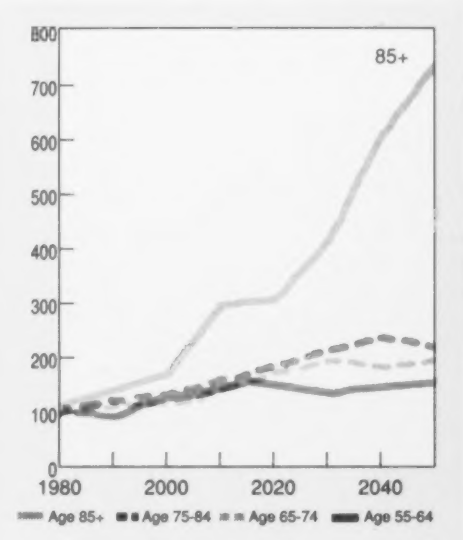
old have been proportionately the fastest growing segment of the aged population.[7] While the older population as a whole increased 11 percent between 1980 and 1985, the number of those 85 years of age and over increased by 20 percent. By the year 2000, the number of people aged 65 and older is expected to increase by an additional 22 percent, while the number of oldest-old is likely to increase by an astounding 82 percent. Figure 3 displays these changes, showing the population 85 and over projected to nearly triple by the year 2020 and nearly double again by 2040. By 2050, almost one in four older persons will be 85 years of age and older, some 5 percent of the total population. This has important policy implications because the oldest-old demand services most.

Again, a notable factor is the impact of the large baby-boom cohorts on the tempo of growth within segments of the older population. Baby boomers cause a rapid increase in the size of the 65 and older population between 2000 and 2020, with a comparable increase in the over-85 population twenty years later. Because of the staggered impact of the aging of the baby boom, pressures for societal adaptation will shift quickly. Concerns about financing retirement will give way to focus on the ability of health care programs and institutions to absorb very old and probably frail elders.

Race and Ethnicity: Another source of diversity in the older population is race and ethnicity. In 1985, over 2.7 million persons, or 10 percent of all persons ages 65 and over, were non-white. Minority elderly have been increasing at a faster rate than white elders in recent years, and this trend is likely to continue well into the next century. By the year 2025, 15 percent of the older population are projected to be non-white, a total of almost 13 million persons.

Minority populations in the United States, however, are still "younger" than the white population: Approximately 11

Figure 3. Projected Growth in the Older Population: 1980-2050



Note: Base year 1980 = 100
Source: U.S. Bureau of the Census

percent of whites were 65 years old and over in 1980, compared to 8 percent of blacks, 6 percent of Asian and Pacific Islanders, and 5 percent of Hispanic and Native American populations. These differences are the result of higher fertility, which broadens the youthful base of the population, higher mortality at younger ages among minorities, and also migration in the case of non-natives.

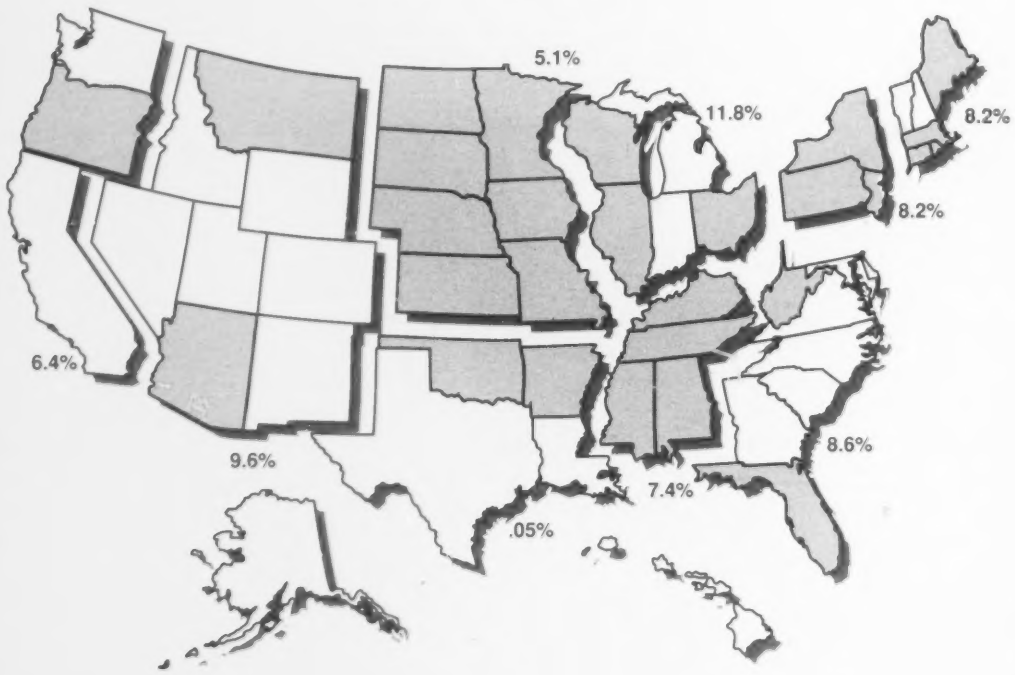
Minority seniors are a minority within a minority. The status and resources of many minority elderly reflect social and economic discrimination experienced earlier in life. For some, there also are the additional, enduring effects of migrating to a new country with a strange language. For nearly all minority elderly, their older years are preceded by lifetime efforts to balance their unique cultural heritage and values with those of the majority white population. Minority elderly, in particular, are more likely to have a greater per capita need for services such

as income maintenance, housing, meals, transportation, and health care.

The gap between white and black life expectancy both at birth and at age 65 is narrowing, as shown in Table 6, though life expectancy for whites still exceeds that of blacks by about 8 percent.[8] In spite of this, at age 75 and over, black mortality rates are lower than those of comparably aged whites. This is in sharp contrast to black-white mortality differences at younger ages. The most widely accepted explanation of this so-called "cross-over" phenomenon emphasizes the highly selective nature of mortality. In a relatively disadvantaged group, mortality removes the more vulnerable members at a younger age, leaving more durable survivors at the older ages. In contrast, easier life conditions promote the survival of both strong and frailer members of the advantaged group to ages when they are more vulnerable to diseases and injuries. The relative advantage of lower mortality for blacks at the older ages does not translate into a quality-of-life advantage. Very old blacks have higher rates of poverty and illness than whites of the same age.

Geographic Distribution: Over one-third of all older persons in the United States live in the South, proportional to that region's total population share. The Northeast and the Midwest have more aged relative to their total population, as shown in Figure 4. The West has less than one-fifth of its population in the older age groups, which is less than its share of total population. The "oldest" popula-

Figure 4. Change in Share of Population 65 and Over by Region, 1980-1986



■ States with 12% and more of population 65 and over, 1986
□ States below 12% of population 65 and over, 1986

tions in the U.S. (outside Florida which has the highest state percentage of older people) are in the New England, Mid-Atlantic, and Midwestern states, with an average 13.5 percent 65 and older (see State Rankings, page 4).

Florida has the largest proportion of elderly, with 17.7 percent of its population 65 or over in 1986. This figure has not changed much since the start of the decade when 17.3 percent of the state's population were older people. Florida receives the largest number of migrants over 65, but these are mainly retirement moves by the "young-old" from the colder Northeast and Midwest regions. Older persons migrating to the Sunbelt tend to be the younger and more affluent of the older population. In the short run, at least, they benefit rather than handicap their places of destination. Most quickly become homeowners, broadening the tax base in their new communities and, since most are retirees, exerting little pressure on the local job market.

Snowbelt states lose more affluent elderly through out-migration; the elderly left behind are older and their financial resources more limited.[9] There is a counterstream of "older-old" persons leaving Florida, presumably to seek care from their families as they become more frail.[10] Those who leave Florida are more likely to be the very old, in poverty, widowed, and have some disability.[11] The return of these more-dependent older persons to the Northeast and the Midwest adds to the costs of health care and other services in these areas.

Unlike Florida's elderly population, many of whom arrive as older migrants from other states, the older population in the Northeast and Midwest is increasing as the result of "aging-in-place," where greater proportions simply age into the 65 and over group. Figure 4 shows that the proportion of older people in New England, for instance, has increased by more than 25 percent since 1980. The relative number of older people in Massachusetts increased by almost 50 percent between 1980 and 1986. These changes are mainly due to high rates of out-migration among the under-65 population in these states, leaving a smaller working-age population to support elders who remain.

According to the 1980 Census, almost two-thirds of the older population lived in metropolitan areas. A majority lived in the suburbs rather than in inner-city neighborhoods. Those over 65, however, have, on balance, been moving from metropolitan to non-metropolitan areas since 1960 with the greatest number of these moves being made by the younger (65-74), healthier old. When people aged 75 and over move, it is usually toward metropolitan areas.

The majority of older people, however, do not move, leading to so-called "gray ghettos." This does not reflect intentional discrimination; rather, while their children have moved to take advantage of work opportunities, parents have gained by living in the same community over time and have fewer reasons to leave.

Table 5. Percent Change in Regional Population of All Ages and Those 65 and Over: 1980 to 1986

Region	All Ages (in thousands) 1980	All Ages (in thousands) 1986	All Ages Percent Change	65 and Over (in thousands) 1980	65 and Over (in thousands) 1986	65 and Over Percent Change
Northeast	49,135	50,017	1.8	6,072	6,698	10.3
Midwest	58,866	59,313	0.8	6,692	7,394	10.5
South	75,372	82,988	10.1	8,488	9,895	16.6
West	43,172	48,760	12.9	4,298	5,185	20.7

Source: U.S. Bureau of the Census

Table 6. Life Expectancy at Birth and at Age 65, by Race and Sex: 1900, 1950, 1975, and 1985

Age, Sex, and Race	1900*	1950	1975	1985**
Life expectancy at birth				
Total	47.3	68.2	72.6	74.9
Men	46.3	65.6	68.8	71.3
Women	48.3	71.1	76.6	78.3
White	47.6	69.1	73.4	75.4
Men	46.6	66.5	69.5	72.0
Women	48.7	72.2	77.3	78.9
Non-White	33.0	60.8	66.8	69.6
Men	32.5	59.1	62.4	65.5
Women	33.5	62.9	71.3	73.6
Life expectancy at age 65				
Total	11.9	13.9	16.1	16.9
Men	11.5	12.8	13.8	14.8
Women	12.2	15.0	18.1	18.6
White	—	—	16.1	17.0
Men	11.5	12.8	13.8	14.8
Women	12.2	15.1	18.2	18.8
Non-white	—	—	15.0	15.5
Men	10.4	12.5	13.1	13.6
Women	11.4	14.5	16.7	16.9

*Death registration area only
**Provisional

Source: National Center for Health Statistics

Survivorship

Substantial improvement in life expectancy at all ages, including extreme old age, is an additional and distinct feature of population aging. Both the size and composition of the older population show the effects of the increasing chances of surviving not only to age 65 but also to age 85. As more Americans survive childhood, adolescence, and adulthood, death has become increasingly an event of old age. Of the over 2.1 million deaths recorded in the U.S. in 1987, almost three-quarters were of those 65 or older, and one-fifth those 85 or older.

Changes in Mortality

Improvements in life expectancy initially favored younger people. Table 6 shows a child born at the turn of the century could expect to live to age 47.3 on the average; by 1985 the average was up to 74.9—a gain of almost 28 years. In 1900, a person aged 65 could look forward to another 11.9 years; in 1986 it was 16.9 more years—a gain of 4.8 years. Most of the increase in life expectancy at birth occurred by 1950, with little change during the 50s and 60s. Since the early 1970s, however, this country has once again witnessed major increases in life expectancy, concentrated this time at the older ages.

Even at ages 65 to 85, and particularly for older women, the improvements in the last 20 years have been substantial. Unlike earlier improvements which were due to reductions in death rates from acute and infectious diseases, more recent improvements reflect declines in mortality from chronic diseases. More importantly, gains in life expectancy at advanced ages are projected to continue. Table 7 shows projected improvements for ages 65 and 85, for males and females. In 2040, when the first of the baby boomers reach 85, their life expectancy is projected to be another 6.3 years for males and 8.8 years for females.[12]

From 1950 to 1985, female life expectancy at age 85 increased by 23.7 per-

Table 7. Life Expectancy at Ages 65 and 85 by Sex: Projections 1990, 2000, 2020, and 2040.

Year	Males		Females	
	at age 65	at age 85	at age 65	at age 85
1990	15.1	5.4	19.1	6.8
2000	15.7	5.7	19.8	7.3
2020	16.4	6.1	20.7	7.9
2040	17.1	6.3	21.5	8.5

Source: Office of the Actuary, Social Security Administration

cent. It is expected to increase another 29.4 percent from 1990 to 2040. During this same time span, the number of women aged 85 and over is projected to increase 67 percent.[13] This implies a 103 percent increase in the number of person-years to be lived by women after age 85. For age-test programs such as Medicare, Social Security, and most private pension plans, this scenario creates a much greater pressure than the projected growth in the sheer number of oldest-old would suggest.

Improvements in life expectancy over this century and the different effects of improvements by age, sex, and race are related to changes in the structure of mortality. After a dramatic decline in deaths from infectious diseases and a modest decline in diseases of infancy, the leading causes of death now are chronic diseases. Today, heart disease, cancer, and stroke account for two-thirds of all deaths. In 1900 this particular cluster of diseases was responsible for only about one out of eight deaths in the U.S.

At the very oldest ages, however, 75 years and over, non-whites have lower death rates than whites. The National Center for Health Statistics reports that in 1985, death rates from all causes for black men and white women were only 80 percent as high as the comparable rates for white men. The rates for black women 85 and over are only 65 percent of those for white men.

Changes in Causes of Death

Mortality patterns of the older population are of special interest because death rates at younger ages are already very low. As early as 1950, 94 percent of white females were surviving to age 50 and 80 percent to age 65. Advanced old age has become the "last frontier" for further, significant reductions in mortality.

Nearly three-quarters of all elderly deaths are attributable to three chronic diseases: heart disease, cerebrovascular disease (strokes), and cancer. Changes in mortality from these diseases are shown in Table 8 for the period from 1950 to 1984. Except for cancer, rates have declined since 1968. Reductions have been greater for males than for females. Because diseases of the heart account for nearly half of the

Table 8. Average Annual Percent Change in Death Rates of Elderly by Cause, Age, and Sex: 1950-1984

Cause of Death, Time Period	Age at Death 65-74	75-84	85 and Over
Males			
Diseases of the heart			
1950-54	−1.0	−1.2	−2.6
1955-67	0.0	−0.2	1.0
1968-80	−2.5	−2.0	−1.5
1980-84	−2.6	−1.4	−0.3
Malignant neoplasms			
1950-54	1.5	1.0	0.2
1955-67	1.1	0.6	1.1
1968-80	0.8	1.3	1.7
1980-84	−0.1	0.4	0.6
Cerebrovascular disease			
1950-54	−1.7	−0.3	−1.1
1955-67	−1.6	−1.0	1.0
1968-80	−5.4	−4.4	−4.1
1980-84	−5.1	−5.4	−4.6
Females			
Diseases of the heart			
1950-54	−2.0	−1.7	−1.1
1955-67	−1.3	−1.1	0.1
1968-80	−3.1	−2.6	−1.9
1980-84	−1.3	−1.6	−0.04
Malignant neoplasms			
1950-54	−0.7	−0.6	−0.3
1955-67	−0.5	−0.9	−0.4
1968-80	0.6	0.2	0.2
1980-84	1.3	1.1	0.3
Cerebrovascular disease			
1950-54	−2.8	−0.9	1.8
1955-67	−2.5	−1.5	0.4
1968-80	−5.4	−4.5	−3.8
1980-84	−4.5	−5.0	−4.4

Source: National Center for Health Statistics

deaths of those 65 and over, changes in the structure of mortality among older people have largely been dictated by trends in the rates of heart disease.

While the risk of dying from major chronic diseases has been declining, the survival time for persons affected appears to have increased. Recently demographers Kenneth Manton and George Myers estimated cause-specific life tables which can be used to show how a specific disease affects survival chances, independent of population composition. Of particular interest are statistics showing the mean age at death. From 1968 to 1982, life-table estimates of mean age at death in which heart disease was involved increased by 2.89 years (to 74.65) for men and by 2.27 years (to 81.58) for women. For deaths involving cancer as a contributing cause, the average age at death was estimated to have increased by 2.63 years (to 72.06) for men and by 2.35 years (to 72.69) for women. Since the mean age at death increased for all causes examined, "It appears that the causes of recent mortality declines result from delays in the progression of the underlying disease processes."[14]

Such estimates suggest that we may be living longer but in a diseased condition; an extended life spent with more illness, disability, and discomfort. While increases in the mean age at death, coupled with gains in life expectancy at the older ages, may be "good news" to individuals, they also portend a future with increasing numbers of disabled and high per capita health care costs. If gains in life expectancy have occurred through reductions in the risk of dying from chronic diseases without reductions in affliction by such diseases, the effects of recent advances will be to extend the period of functional dependence prior to death. On the other hand, if recent changes have postponed the average age at which an individual experiences a chronic illness, increases in life expectancy would imply additional years of an active, physically comfortable life.

Table 9. Selected Chronic Conditions of the Population 65 and Over by Sex, 1986

(per thousand persons)

Condition	Males	Females
Arthritis	358.6	565.8
Cataracts and other visual impairments	242.0	301.0
Hearing impairment	371.0	242.7
Orthopedic impairment	137.4	197.5
Heart disease	295.5	263.3
Hypertension	329.5	440.0
Cerebovascular disease	66.0	65.7
Diabetes	99.2	97.6

Source: National Center for Health Statistics

Illness and Disability

Old age is not itself a disease, but the risk of chronic, degenerative diseases increases markedly with age. The diseases that are the primary cause of disability are not, for the most part, those that cause death at the older ages.

Four out of every five noninstitutionalized older persons have at least one chronic condition and many have more than one. The most common of these diseases are arthritis, hypertension, heart disease, and hearing impairments. These four conditions together account for nearly 60 percent of all the chronic diseases reported by the community-based elderly. The prevalence of these diseases among those aged 65 and over is about five times that observed for younger persons.[15]

Organic mental disorders are the most prevalent of the psychiatric diseases in late life. Most epidemiologic efforts to estimate the prevalence of these conditions, the diagnosis of which can be confirmed only at autopsy, suggest that 4 to 6 percent of all older persons are affected. For those over 80, the rate may be as high as 20 percent.[16] Other evidence suggests that the prevalence may be increasing. It is important to note, however, that Alzheimer's disease—the

most disabling of the organic mental disorders—and other irreversible dementias are not an inevitable part of the human aging experience.

Not all of the major chronic illnesses pose a threat to the quality of life or erode personal independence. In a population with substantial numbers having more than one chronic condition, a useful approach is to consider the functional capacity of the older person: Whether help is required in carrying out such basic activities as eating, bathing, and dressing. Of the 26.4 million persons aged 65 and over living in the community in 1984, about 6 million, or 22.7 percent, had some difficulty in performing at least one of the basic activities of daily living.[17]

The risk of functional disability increases rapidly after age 65, as indicated in Table 10. Whereas only about 15 percent of those aged 65 to 69 need help with any of the seven activities of daily living considered here, nearly half of those aged 85 and over have some difficulty performing at least one of these self-care activities. At all ages, walking is the most common problem, while eating is the activity least likely to pose a problem. Note that even among the oldest-old, fewer than one in five have substantial difficulties with four or more of these basic activities.

Although very few older people not in institutions are disease-free, a majority manifest little, if any, functional incapacity. Thus, contrary to popular stereotypes, frailty is not synonymous with old age. Furthermore, disability is more reversible than previously thought possible. In a two-year follow-up of approximately 4,000 older persons living in the community at the first time of observation, 22 percent of those severely disabled in 1982 had improved functional capacity 24 months later.[18] In addition, 82 percent of those who were not functionally limited maintained their status and independence over the two-year period.

Table 10. Percent of Elderly With Number of Personal Care Activities Reported Difficult, 1984

	Number of Personal Care Activities* That Are Difficult				
Age	None	1	2	3	4-7
65 and over	77.3	9.2	4.7	2.8	5.9
65-69	85.3	6.8	3.1	1.5	3.2
70-74	79.9	9.1	4.4	2.4	4.2
75-79	75.9	10.8	4.3	3.3	5.7
80-84	65.6	12.1	7.4	4.6	10.4
85 and over	51.2	12.8	10.2	6.7	19.2

*Personal care activities and the percent of elderly in the community affected are: walking (18.7%); bathing (9.8%); getting outside (9.6%); getting in and out of bed or chair (8.0%); dressing (6.2%); using the toilet (4.3%); and eating (1.8%).

Source: National Center for Health Statistics

Approaches to Understanding Disease, Disability, and Mortality

The total number of older, functionally-limited persons in both the community and in nursing homes was estimated to be 5.6 million in 1980. The number of those needing long-term care is projected to increase to 9 million by 2000 and to 18 million by 2040.[19] If this projection proves accurate, the impact on public expenditures for long-term services will be staggering. Nursing home expenditures alone would triple by 2000 to some $129 billion.[20]

How likely is this scenario? A number of factors, including the number, type, and cost of care options in the future and the structure of public reimbursements must be considered. More fundamentally, though, future demand for long-term care services depends on the relationship between morbidity, disability, and mortality at older ages.

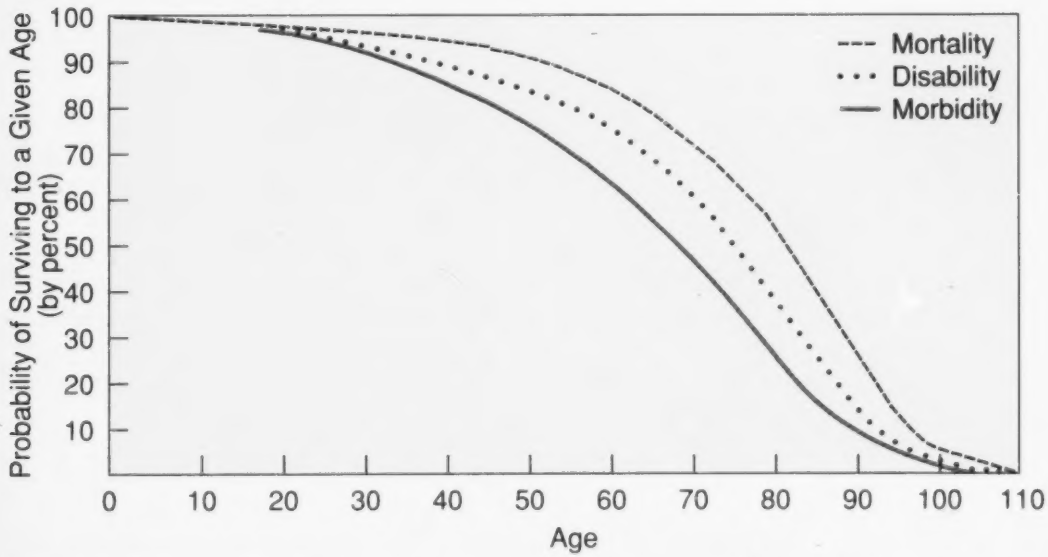
It has already been noted that while the average age at death is being pushed back, the length of the period spent sick and disabled prior to death may be increasing. This seeming paradox is the focus of much debate. The morbidity-disability-mortality relationship has very

real implications for public health policy and health care planning.

To clarify this debate, a scientific advisory panel of the World Health Organization proposed a simplified model drawing upon basic life table concepts.[21] Figure 5 shows curves describing the survival (out of an initial 100 percent) of a cohort to a given age before experiencing illness, disability, or death. The areas under the curves describe the number of person-years spent by a cohort in a given health state. The area under the morbidity curve represents the number of person-years spent free of disease, i.e., "healthy" life expectancy. Because this model assumes that disability can only result from an underlying disease process, the area between the curves labeled "morbidity" and "disability" represents the person-years spent in an ill, but non-disabled, condition. The total area under the "disability" curve refers to what has become known as "active life expectancy."[22] This model can be used to examine the societal implications of various theories of health transitions in later life.

The "Life Span Expansion" theory, for example, postulates that basic research into the human aging process might yield interventions that could increase the human life span (the biologic limit to life as opposed to life expectancy, or the average length of life) by as much as 25 years within the next three decades.[23] It has been suggested that dramatic changes in nutrition could result in such a lengthening of the life span in a short time. But such interventions would merely delay the age at which illness or disability appears, and the same number of years would still be spent in decline. Consequently, only the productive life span would be increased. In terms of the model shown in Figure 5, this perspective would simply shift the curves outward 25 years along the age axis. Were this to happen, society would have to deal with the challenge of channeling the increased productivity of its citizens.

Figure 5. Mortality (Observed), Morbidity (Hypothetical), and Disability (Hypothetical) Survival Curves for U.S. Females, 1980



Source: Manton, Kenneth G. and Beth J. Soldo, "Dynamics of Health Changes in the Oldest Old: New Perspectives and Evidence," *Milbank Memorial Fund Quarterly*, Vol. 63, No. 2 (Spring 1985) p. 210.

A second approach, the "Pandemic of Chronic Disease and Mental Disorders," offers a distinctly different vision of the future. It suggests that though there have been significant increases in life expectancy, there is little evidence of change in the age of onset of either chronic disease or disability. Furthermore, better medical knowledge and treatment of previously fatal complications of chronic diseases lengthens the time spent ill.[24] Thus, while the morbidity and disability curves in Figure 5 would remain relatively fixed, the mortality curve would be shifted to the right, increasing the number of person-years in the sick and disabled state. Such a scenario illustrates public expenditures favoring disease management at the expense of disease prevention measures.

Perhaps because we would all like to believe that an easy, disease-free death awaits us, a third theory, "Compression of Morbidity," has received considerable popular attention. James Fries argues that we are rapidly approaching a time in the U.S. where the survival curve will become "rectangular," i.e., most persons will survive to their biologically-endowed life span and die a "natural death."[25] Through appropriate changes in life style patterns, he also envisions morbidity and disability curves shifting toward the mortality curve, at the same time that life expectancy converges on a fixed, predetermined limit to human life. In terms of Figure 5, this would compress the areas under the first two curves and significantly reduce the number of person-years spent in health-impaired states.

The evidence Fries presents to support his approach is contested by demographers and public health experts. There is now no solid evidence of convergence of life expectancy on the limits of human life span. Even if longevity-inducing habits were adopted en masse tomorrow, it would probably take a half century for the accumulated effects of risk behavior, such as smoking, to be removed from the population. Also, new data on genetic risk factors suggest that prevention measures are unlikely to be totally effective in a population as diverse as America's.

Drawing on evidence that many of the diseases associated with aging can be identified with age-related pathologies that are not intrinsic to the aging process itself, Kenneth Manton has proposed a theory of "dynamic equilibrium" to describe relationships among various health outcomes.[26] If disease incidence has been relatively constant over time but disease prevalence increasing, then recent mortality reductions could only have been accomplished through increased duration of disease episodes. In a sense Manton's model appears initially to be a recasting of the "Pandemic of Chronic Disease" approach but, rather than emphasizing the increase in sick and disabled person-years, Manton focuses on slowing the progress and severity of disease. The concept of equilibrium, therefore, implies that the severity and rate of progression are correlated to some extent with the reduced risk of death at older ages. In the life table model shown in Figure 5, this would imply that, as the mortality curve shifts outward, a biologic feedback process could draw the morbidity and disability curves along with it on the age axis, but not necessarily in exact proportion.

Data currently available in the United States do not provide the information necessary to estimate the model shown in Figure 5. However, Canadian data allow estimation of a similar model with cross-sectional data. For the period 1951 to 1978, a time of escalating health care costs in Canada, life expectancy at birth increased by 6.0 years. The average length of time spent in a disabled state also increased, by 4.7 years.[27] In other words, over 80 percent of the gain in life expectancy was concentrated in a period of disease and illness. The gain in "active" life expectancy was relatively minor in comparison.

This and other evidence suggests that the three outcomes shown in Figure 5 are interdependent and that changes in one will offset the others. This finding has im-

portant policy implications.

First, the elderly's future health care needs would be underestimated by simple projections of current age-specific disability rates. Changes in the underlying age-related risk of disability will also affect the demand for health care services.

While it is likely that the age at disease onset will be postponed, the prevalence of chronic illness could increase as the duration of chronic disability lengthens. Public health care policy needs to identify and invest in strategies that will slow the rate at which the chronic diseases progress. To the extent that chronic disability can be retarded, the effect of increasing disease prevalence on health care resources could be blunted. New strategies to manage disease, such as the implanted insulin pump for diabetics, are promising in this regard.

Another consideration is the increasing heterogeneity of those who survive to old age. Those who live into their 80s and beyond today are truly the hardiest of the hardy. But, in the future, those who would have previously succumbed at an earlier age, will increasingly survive to the extremes of old age. By postponing the deaths of these vulnerable individuals, the mix of health states in the older population could be altered in such a way as to amplify the demand for intensive medical and personal care services.

Another set of policy issues revolves around the appropriate mix of expenditures for disease prevention versus disease management. Although it is clear that certain disease risks can be reduced through changes in behavior and habits, getting people to adopt preventive health measures, such as lowering cholesterol, losing weight, or stopping smoking, continues to challenge public health specialists. Genetic predispositions also may undermine the benefit of some preventive initiatives. Neither is it readily apparent how the health care system can be effectively reoriented from disease management and treatment to prevention.

Quality of Life

After health, economic and social resources make the greatest difference in the quality of daily life for the older population. Older people have less cash income than younger people and spend relatively more of their income on food, housing, and health care. In 1986, 3.5 million older persons, (12.4 percent of the total) had incomes below the poverty level. On the plus side, a majority of older adults own homes, often mortgage-free, and are usually integrated into viable support networks of family and friends. However, most older women are widows and 51 percent of women 75 years of age and over lived alone in 1986.

Education

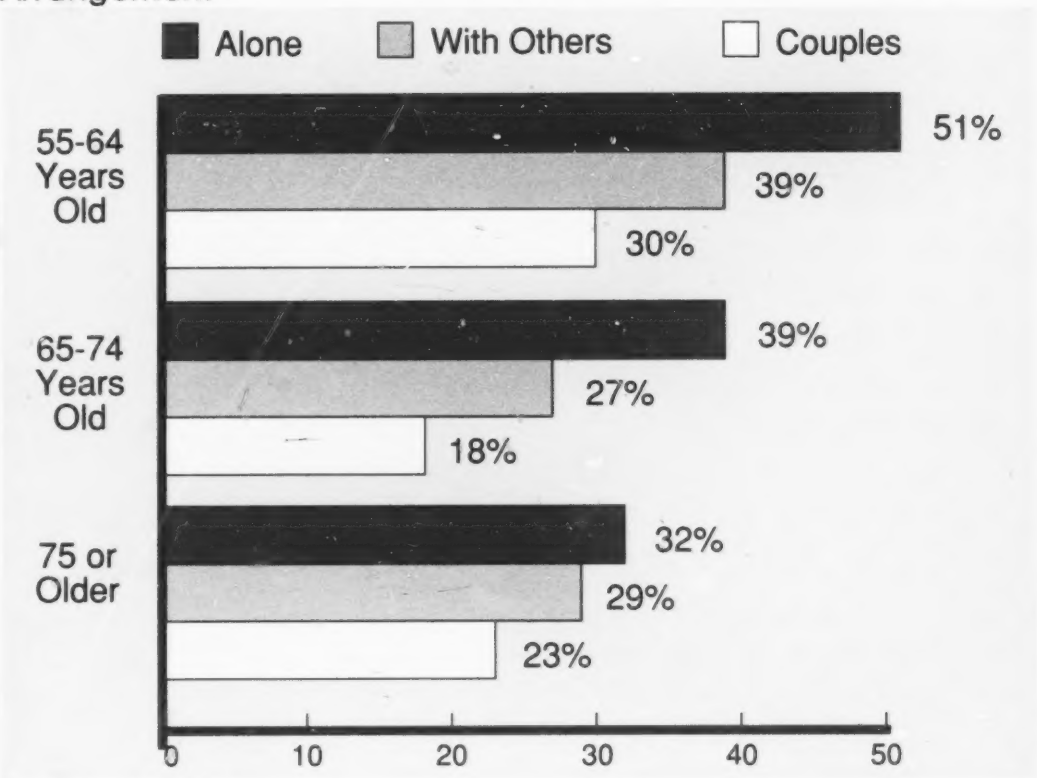
As educational levels have increased over time, successive cohorts of older persons are better educated, on average, than their predecessors. As of 1987, over half (51 percent) of the population aged 65 and over had graduated from high school, an increase from one-third in 1978. Between 1970 and 1987, the median number of school years completed by those 65 and older increased from 8.7 to 12.0.

Although most elderly people are no longer concerned with converting their education into wages, comparatively low levels of education do handicap many elders. Even as the average educational attainment is rising, over 6 percent of the older population (about 1.78 million persons) in 1987 had less than 5 years of formal schooling. Poorly educated older adults may have trouble finding assistance through services and programs, and once they do, may find it difficult to negotiate the bureaucratic maze.

Employment

Many people retire in their late 50s and early 60s, rather than the traditional 65; some continue working into their 70s. In 1986, almost 90 percent of men ages 50

Figure 6. Dissatisfaction with Life by Age and Living Arrangement



Source: University of Michigan

to 54 were in the labor force. By ages 62 to 64, however, the labor force participation rate drops to 45.4 percent. Figure 7 shows how the rate continues to decline with age. Only 10.4 percent of men and 4.3 percent of women after age 70 are in the labor force.

A large proportion (32 percent) of those in the labor force after age 65 are in service and clerical jobs that are less physically demanding than many other types of work. The general market shift towards more technical and service work, in combination with increasing levels of education, may mean a longer working life for older Americans in the future.

For a majority of older adults, retirement is a specific event, celebrated with gifts and parties on their last day of work; for others, it is a gradual process marked by shifts from full-time work to reduced hours per week or fewer weeks per year and finally to full retirement. It is difficult to determine whether most workers retire abruptly by choice or because part-time jobs for older persons are scarce. In 1986, 47 percent of men and 59 percent of women over 65 who were working held part-time positions.

For an unknown proportion of elders, "retirement" or the "discouraged older worker" is simply a more socially acceptable description of a long period of unemployment. Official unemploymnt rates for those 65 and over are low (3 percent for men and 2.6 percent for women in 1986) but such statistics do not include elder workers who simply stop looking for a job. Older blacks are more likely than whites to fall into this group.

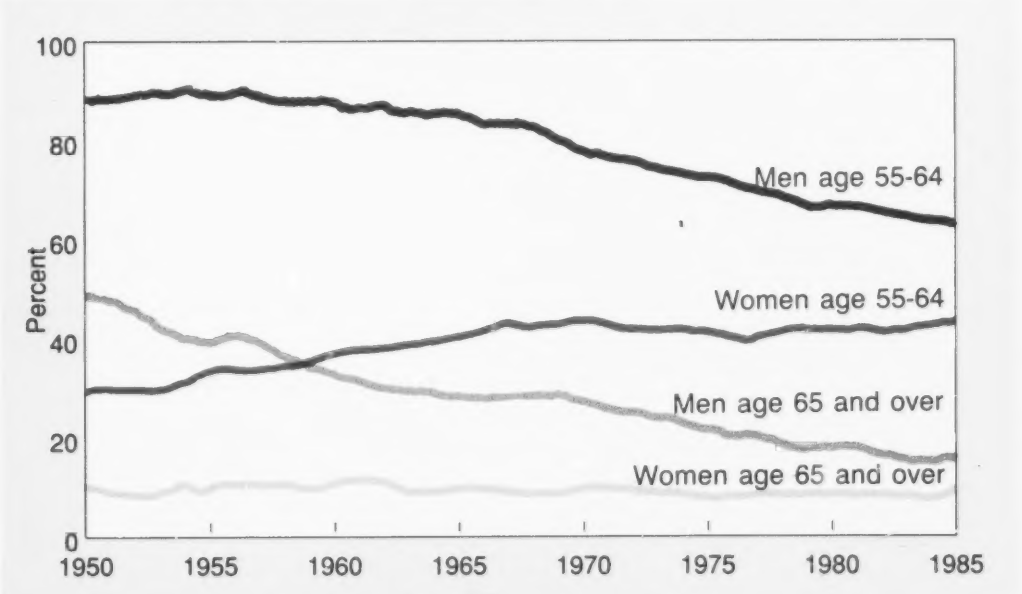
Unemployed adults ages 55 and over have much longer average periods of unemployment than younger workers. An older job-seeking adult may also be handicapped by outdated job skills and less education than younger competitors, particularly in the current age of computer technology. In 1984, about one-quarter (24 percent) of adults between 18 and 54 years of age had computer experience, but only 9.5 percent of those aged 55 to 64 and less than 1 percent of those 65 years and older had ever used a computer.[28] Discrimination against older workers, "ageism," is countered through the Equal Opportunity Employment Commission and the U.S. Commission on Civil Rights.

Early retirement has caught on rapidly with older men. Figure 7 shows that, over the last four decades, labor force participation rates for men ages 55 through 64 have dropped from 87 percent in 1950 to 68 percent in 1987. Among those 65 years of age and older, the rate has dropped by more than 50 percent, from 45.8 in 1950 to 16.3 percent in 1987.

Older women, however, show just the opposite trend. Since 1950, labor force participation rates for women ages 55 through 64 have nearly doubled, reflecting the increased employment of women of all ages. The percent of women aged 65 and over who work has remained fairly stable during this time, however.

Increased Social Security benefits and greater coverage of the civilian labor force by private pension plans have fueled the trend towards earlier retirement. In 1986, for example, 62 percent of men and 72 percent of women receiving Social Security benefits were early retirees with reduced benefit levels, as compared with 36 percent and 59 percent, respectively, as recently as 1970.[29] The General Accounting Office reports that almost two-thirds of all those receiving private retirement benefits in 1985 stopped working before their 65th birthday.[30]

Figure 7. Labor Force Participation: 1950-1985



Source: U.S. Bureau of the Census and the Bureau for Labor Statistics

Income

There is significant variation between wealth and poverty in the income distribution of the elderly. Personal income usually drops by one-third to one-half with retirement. With that cut, many older persons encounter poverty for the first time in their lives. In 1986, 3.5 million of the elderly, or about one in eight (12.4 percent), had incomes below the poverty level. Less than one in ten younger adults were similarly impoverished.

Poverty rates increase with age even among the elderly. In 1986, almost one in five (18 percent) of those 85 and over lived below the poverty level as compared to one in ten of the those aged 65-74. Poverty rates also were higher for elderly women than men (15 versus 8 percent) and higher for blacks than whites (31 versus 11 percent). Compared to white men, white women and members of minority groups, in general, are more likely to have had numerous periods of unemployment, held low-paying jobs (both of which reduce monthly Social Security benefits at retirement), and had jobs not covered by private pension plans.

At the extremes of poverty are those who suffer the cumulative effects of being old, female, and a member of a minority group—60 percent of black women 65 and older, not living in families, were below the poverty level in 1986. These official estimates would be higher still if they included the "hidden poor"—older persons whose low incomes force them to live with younger relatives.

But annual income does not represent the total "net worth" of an older person. Net worth includes the value of assets such as real estate, savings, and investments. While a sizeable majority of elders own their homes, the median net equity of a home owned by an older person in 1983 was only 83.7 percent of that owned by someone 45-54 years of age.[31] Older people also are somewhat less likely to have liquid assets than middle-aged adults. Nonetheless, those who do have median liquid assets equaling $9,676 and $7,885 for ages 65-74 and 75 and over respectively. In contrast, the median liquid assets of those between 45 and 54 were $4,131 in 1983.[32]

Official measures of poverty exclude not only assets that do not generate annual income but also the in-kind value of services received by older people, such as Food Stamp benefits, subsidized housing, and Medicare-reimbursed services. Special tax provisions also benefit elders, although the impact of the 1986 Tax Reform Act has yet to be seen.

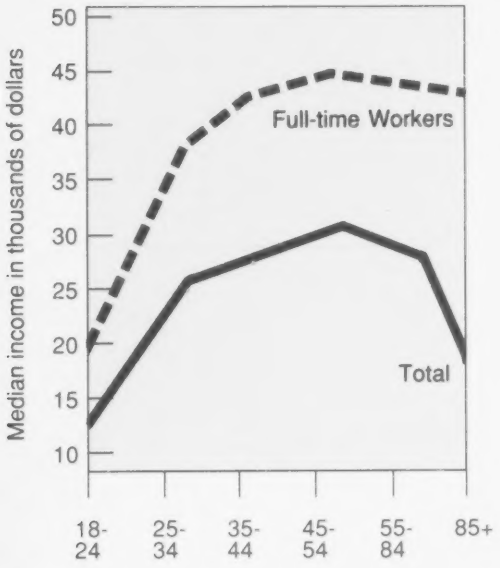
In 1986, the median income for men 65 and older ($11,544) was only 51 percent of the median income of men aged 25 through 64 ($22,682). Older women receive, on average, 64 percent of the income of their younger counterparts ($6,425 versus $10,030).[33] As can be seen in Figure 8, median income for all households increases with the age of the household head until age 55, when a decline begins. After age 65 the drop is dramatic. Most of this decline can be attributed to a loss in earnings after retirement. Looking only at households where there is a full-time working householder, the drop is much less precipitous.

It is, of course, inappropriate to use cross-sectional data, such as those shown in Figure 8, to represent true life patterns. Longitudinal data indicate that the drop in income following retirement is much less dramatic than that represented by cross-sectional data. Such data confound age and cohort differences.

Not all elderly individuals or families are at a financial disadvantage in old age. More than 10 percent of households with a head 65 or older had total household incomes of $40,000 or more in 1986. This can be compared, however, to households whose heads were 45-54 years of age, where almost half (48 percent) had incomes of $40,000 and more.

Older people's financial status depends a great deal on where their money comes from. Most rely upon a mix of sources—Social Security benefits, pen-

Figure 8. Median Income of Households by Age of Householder and Work Status, 1986



sions (both public and private), wages and salaries, and income from savings or investments. Social Security is by far the most important of these. Since almost all older persons are covered by the system, monthly Social Security checks alone account for four of every ten dollars of money income among older persons (see Figure 9).

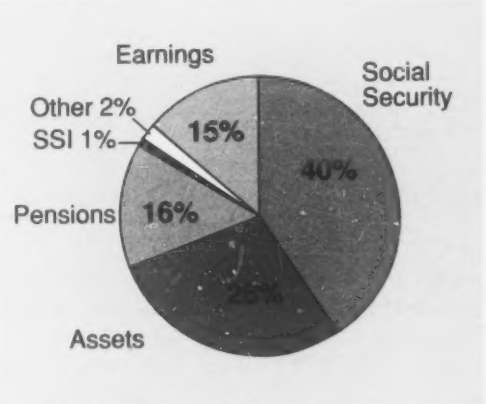
As early retirement has become more popular, Social Security benefits have increased in importance compared to earnings. Whereas in 1970 older persons received almost 50 percent of their income from wages and salaries and 25 percent from Social Security, in 1986 only 15 percent of the older population's income was from earnings and 40 percent came from Social Security. In 1984, 13 percent of all households headed by an older person depended on Social Security for all of their income.[34] Because such benefits were never intended to completely replace working income, those who rely exclusively on Social Security payments are very likely to have incomes below the poverty level. The average monthly payment for a worker retiring in January 1988 from low-paying work is $623, stretching from a low of $410 to a high of $835. The average monthly Social Security payment in 1987 was $491.

Expenditures

Although retirees do not usually have the expenditure requirements of younger, working families, they still must buy basic necessities. As Figure 10, page 28 shows, families headed by an older person allocate more of their income to food, housing, and health care than younger families.

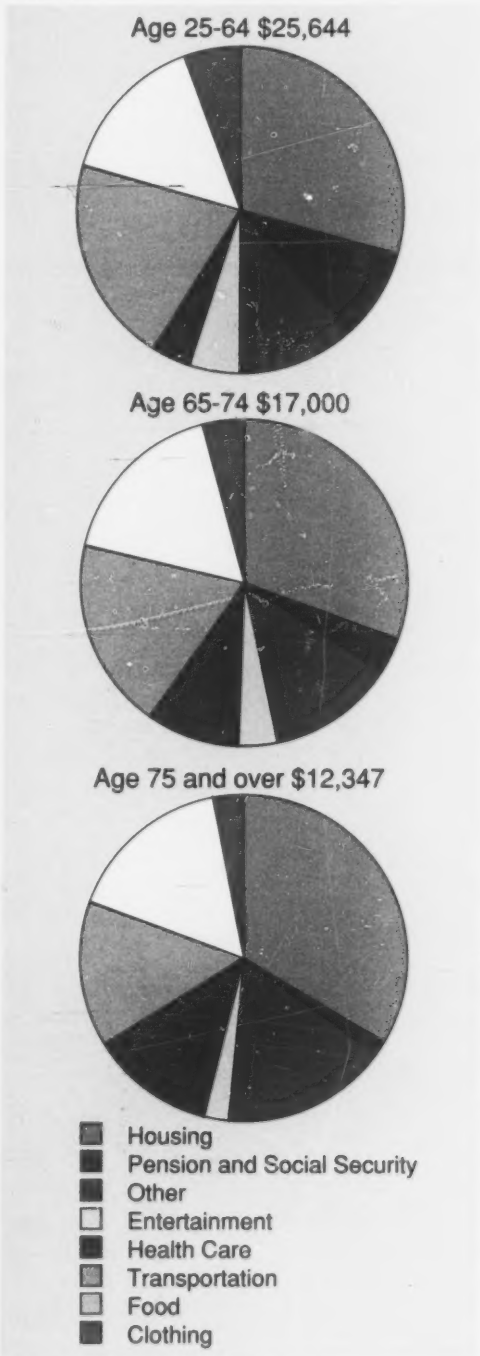
Although the average income of families with household heads 65 or older has risen, more of this income is being spent on basic necessities, particularly housing and health care. In 1972, older households allocated 29 percent of all expenditures to housing and 8 percent to health care. By 1985, these proportions had increased to 32 percent and 10 percent, respectively. Average expenditures on food and entertainment have fallen, however, from 21 percent and 6 percent in 1972 to 17 percent and 3 percent in 1985.

Figure 9. Sources of Income of Older U.S. Population, 1986



Source: U.S. Bureau of the Census

Figure 10. Distribution of Annual Expenditures by Age, 1985



Source: Bureau of Labor Statistics

Estimated per capita expenditure for health care in 1984 by persons 65 and over was $4,202. One-quarter was paid by the individual and 67 percent by federal programs such as Medicare (48.8 percent) and Medicaid (12.8 percent).[35] Direct individual payments for health care averaged 15 percent of the older population's income in 1984—the same share that was spent before Medicare and Medicaid came into existence. Older Americans paid an average $728 to be enrolled in the Medicare program in 1987, with out-patient prescription drug costs projected to be $300 per individual in 1988, triple the cost in 1980. It is not only that more people living longer require more health care, but that health care costs themselves are soaring.

Housing

The majority of our older population is reasonably well housed, although often in smaller, more modest homes than the rest of the population. Over three-quarters of elderly householders owned their own homes in 1987. Elderly married couples were the most likely to own their residence (88 percent) and elderly female householders were the least likely (65 percent).

More than three-quarters of the homes owned by older persons were mortgage-free in 1984.[36] In fact, more than 90 percent of those aged 85 or over owned their homes free and clear. By comparison, only about one-quarter of non-elderly homeowners were in such an enviable position. The homes owned by the older population, however, tend to be less valuable, less well insulated, and older than those of younger adults. Over two-thirds of older homeowners live in houses built prior to 1950, and over one-third in units built before World War II.

The 1983 National Survey of Housing revealed that 8 percent of the houses belonging to older persons were considered inadequate. This creates maintenance problems for older homeowners whose fixed incomes constrain their abil-

ity to hire others and whose health problems and impairments may limit their ability to make their own repairs. Older black homeowners, those with poverty-level incomes, and those living in the South or in rural areas are most likely to occupy houses in need of repair.

Overall, the older population allocates only slightly more income to housing than younger people—32 percent versus 30 percent. Nonetheless, there are still about 2.3 million older people who have excessive housing burdens. Approximately 25 percent of older renters spend at least a third of their income for housing.

Data are not yet available on the effects of the recent "boom" in alternative housing for the older population: Congregate residences, group homes, life care centers, and facilities which combine some form of personal and/or medical care with residential community living. Recent studies suggest that the vast majority of older persons continue to live in traditional types of housing.

With advancing age and disability, many older persons do, however, modify their dwelling units by installing ramps, grab bars, raised toilets, or widened doorways. About one-third of those needing long-term care surveyed in 1982 had made such housing adaptations.[37]

Marital Status and Living Arrangements

People's ability to cope with the changes in health and income that come with old age depends a great deal on their marital status and living arrangements. We have already seen, for example, that older married couples are considerably better off financially than single older persons.

Most older men are married and living with their spouses—80 percent at ages 65-74 and 66 percent of those aged 75 and over in 1987. Women at ages 65-74, by contrast, are more likely to be widowed (37 percent) and less likely to be married (51 percent), as shown in Table 11. Women are far more likely to be widowed than married at age 75 and over. This reflects women's greater longevity and the fact that they normally marry men somewhat older than themselves.

Table 11. Marital Status of Population 65 and Over by Sex, 1987

(in thousands and by percent)

Marital Status	Males		Females	
	65-74	75 +	65-74	75 +
Total	7,608	3,970	9,624	6,773
Never married	4.7	4.3	4.8	6.4
Married, spouse present	79.7	65.9	51.0	22.4
Married, spouse absent	0.7	1.9	0.8	0.9
Widowed	9.0	23.6	36.7	67.0
Separated	1.1	1.0	1.2	0.6
Divorced	4.8	3.3	5.5	2.7

Source: U.S. Bureau of the Census

Age is not an obstacle to entering into marriage. An estimated 71,000 persons 65 and over married in 1985, some 25,000 women and 46,000 men. Almost one-quarter (23.8 percent) of the grooms 65 and over were divorced while three of every four brides were widowed.[38]

Sex differences in marital status have direct implications for the living arrangements of older people. The data in Table 12, page 30 show that men are considerably more likely to be living with a spouse present than are older women. Because of their much greater risk of widowhood, older women are more likely than older men to live alone or with others. After age 75, for example, women are more than twice as likely as men to be living alone (52 percent versus 22 percent).

Since at least 1950, the number of older women living alone has steadily increased.[39] But this trend does not mean that older people are being abandoned by their families. In 1984, only 28.8 percent of the elderly living alone were childless. Of the sizeable majority that had at least one surviving child, nearly three-

Table 12. Living Arrangements of Population 65 and Over by Sex, 1987

(in thousands and by percent)

Type of Living Arrangement	Males		Females	
	65-74	75 and Over	65-74	75 and Over
Total	7,608	3,970	9,624	6,773
Family householder	78.3	65.7	10.1	10.1
Nonfamily householder	1.2	0.7	0.7	1.1
Living alone	12.3	21.8	33.5	51.5
Spouse of householder	3.6	2.5	48.3	21.2
Other relative of householder	3.3	7.3	6.4	13.9
Nonrelative of householder	1.3	1.2	0.8	1.3
Group quarters	—	0.8	0.2	0.9

Source: U.S. Bureau of the Census

fourths had a child who lived within minutes of them and about 64 percent saw at least one of their adult children weekly.[40] This pattern of successive generations living separately but maintaining frequent contact with one another has been described as "intimacy at a distance."

Elders who remain in the community in spite of severe problems in personal-care capabilities, however, are more likely to live with others than to live alone.[41] For the unmarried older person, a majority women, this usually means living with children. Newly-released data suggest that there is a natural progression from more to less independent arrangements in the community. These transitions parallel eroding capacities for self-care.[42]

For some, entry into a nursing home is the final accommodation to disability. But contrary to popular belief, only about 5 percent of the older population are institutionalized at any point in time. Rates of nursing home residency increase with age, from 12.5 per thousand persons ages 65 to 74 to 219.4 per thousand ages 85 and over.[43] Although there is considerable disagreement about the best way to estimate the probability of spending some time in a nursing home prior to death, the most rigorous methods yield estimates of a life-time risk between 37 percent and 43 percent at age 65.[44] Older nursing home residents are quite different from the elderly who live in the community. Cross-sectional comparisons indicate, for example, that nursing home residents are disproportionately very old (45 percent are aged 85 or over), female (64 percent), and unmarried (59 percent). Older people who live in nursing homes are not institutionalized because they are old or abandoned by their families. Rather, they live in such facilities because they are sick. Over half need assistance with five or six daily-living activities and are considered severely disabled. About one-third are reported to be "senile" and 55 percent are incontinent in some measure.[45]

Family Status and Informal Care

Very few older persons are truly without kin.[46] Even those who have lost their spouses are likely to have surviving children or siblings.

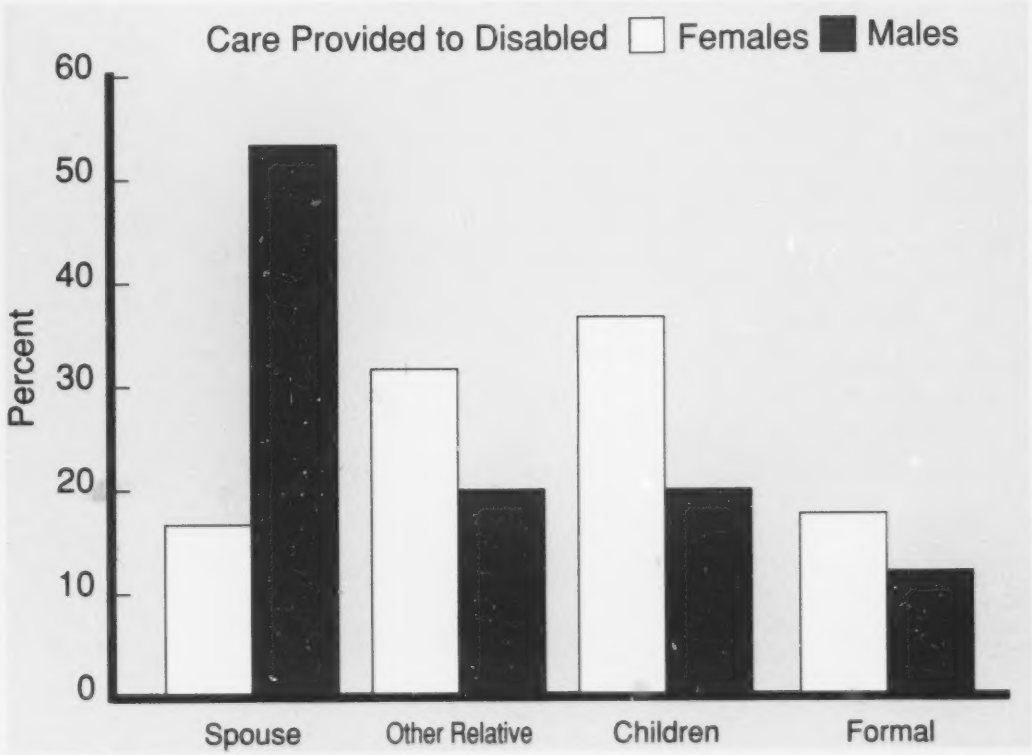
At any age, the family is an important source of emotional and social support. For the frail elderly, relatives are also their major source of assistance for a wide range of daily activities, including household tasks, such as meal preparation, and personal hygiene tasks, such as bathing and using the toilet. Over 90 percent of the older disabled people who are not in institutions depend, in whole or in part, on family and friends for the care they receive; 70 percent rely exclusively

on such helpers.[47] Turning to outside professional, or formal, helpers appears to be a last resort. Family care at home is the wish of most elderly.

If married, the disabled person is most likely to depend on his or her spouse for assistance. Because older men are much more likely to have a surviving spouse, over half of the care received by elderly men is provided by their wives, as shown in Figure 11. But older women, more likely to be widowed, receive the bulk of their care from their adult children. Most often this means that the primary caregiver is a daughter or daughter-in-law. In 1982 many caregiving daughters lived with their dependent mothers, about 44 percent were working, and nearly 25 percent had a young child of their own at home.[48] Thus, most caregiving daughters must reconcile the competing demands of work and child-rearing with parent care.

The younger old of the 1980s and 90s will be well-endowed with family resources. They are the parents of the large baby-boom cohorts. Many demographers anticipate that the future supply of family caregivers will decline as the low-fertility baby boomers themselves turn 65. Also, with the increasing rates of female labor force participation, adult daughters may be less available to their aged parents. A substantial share of the costs of maintaining the frail elderly in the community would then be shifted to the public sector or to the growing fee-for-service home-care industry.

Figure 11. Percent of Caregiving Days by Relationship of the Caregiver



Source: Stone, Robin, Gail Lee Cafferata, and Judith Sangl, "Caregivers of the Frail Elderly: A National Profile," *The Gerontologist*, Vol. 27, No. 5, October 1987.

Government Help for the Elderly

America's concern for the care and well-being of the elderly has increased steadily in the past 20 years, a trend which reflects both the sheer growth in the number of older persons and the gradual transfer of some traditional family functions to the public sector. Despite general improvements in the quality of life for many older persons, problems of poor housing, social isolation, physical limitations, and low incomes combine to make daily life a struggle for millions of older individuals.

The Older Americans Act of 1965 sets federal policy towards older persons, while federal assistance to the older population is channeled through the Administration on Aging of the U.S. Department of Health and Human Services.

The oldest and best known federal programs for the older population are directed by the 52-year-old Social Security Administration (SSA) of the Department of Health and Human Services. As of July 1987, 37.9 million persons were receiving Social Security benefits under the Old Age, Survivors, and Disability Insurance program, including 23.3 million retired workers, and 3.5 million dependents of retired workers. The average monthly benefit received by retired workers was $491 and during the year ending in July 1987 over $200 billion in Social Security cash benefits were paid out.

Social Security benefit levels are adjusted each January to match changes in the Consumer Price Index (CPI). These were increased by 4.2 percent in January 1988, paralleling the increase in the CPI. The development of a separate CPI for persons 62 and over now underway will undoubtedly affect future benefits.

In addition, SSA directs the Supplemental Security Income (SSI) program begun in 1974 to replace state welfare programs for the aged, providing income supplements to qualifying low-income, aged, and disabled persons. As of January 1988, the maximum monthly benefit for an individual was $354, which translates to an annual income of $4,248. Of the 4.3 million persons receiving SSI benefits in 1987, over 2 million were aged 65 or older.

The Social Services Block Grant Program (Title XX) makes grants directly to the states, with most of their programs attempting to shore up the ability of older people to function independently. Among the more available Title XX services for older persons are adult day care, homemaker services, help with chores, transportation, senior centers, and meal delivery. In 1986, all 50 states and the District of Columbia provided such services to older people living at home. In 1987, a total of $2.7 billion was distributed to states under the Social Services Block Grant Program.

The Health Care Financing Administration (HCFA) in the Department of Health and Human Services operates Medicaid and Medicare—the principal sources of funds for health services for America's older population. Medicaid reimburses health care costs for low-income individuals of any age; Medicare benefits are reserved for older people. Both the Medicaid and Medicare programs have been criticized for emphasizing institutionalization as a long-term care solution at the expense of home-care options.

During the 1970s, the main focus of federal health care services and legislation was ensuring equal access to services. As demand escalated, the response of the government was an attempt to provide an adequate level of health care for the population in need. This has been followed, in the 1980s, by an emphasis on cost-containment, involving research on home- and community-based services, and the recent increase of Part B Medicare premiums by 38.5 percent in 1988.

As a part of this effort, in 1983 Congress passed legislation creating the Prospective Payment System (PPS) to regulate Medicare reimbursement to

ACTION/Biddle

Volunteers delivering meals to homebound elderly, Colorado.

hospitals for acute medical care. PPS uses 473 Diagnosis-Related Groups (DRGs) to determine a fixed reimbursement for services. Hospitals accepting Medicare reimbursements cannot pass the difference between the cost of their treatment and the Medicare reimbursement along to patients. Because DRG-based reimbursement is tied to average length-of-stays for each disease category, advocates are concerned that hospitals may be discharging patients prematurely. Comparative studies have shown that patients were more likely to transfer to a skilled nursing facility or to use Home Health Aide services than in the pre-DRG period.[49]

Housing assistance for older persons is provided by the Department of Housing and Urban Development (HUD). The Housing Assistance Payments Program (better known as the "Section 8" program) attempts to increase the purchasing power of low-income households in the local rental market and provides direct cash subsidies to landlords and developers. Perhaps the best known of HUD programs is the low-rent public housing program for low-income persons. HUD supports construction of new units for older and handicapped persons through the Section 202 program. HUD's housing assistance programs have dropped from $25 billion in Fiscal Year 1981 to $7.9 billion in FY 1988. The Department of Energy also supports housing maintenance and repairs. The Farmers Home Administration of the Department of Agriculture makes low-interest loans available to older people in rural areas.

Other government organizations offering assistance to the elderly include the Department of Labor which provides employment services and opportunities to older workers. The Department of Transportation is charged with ensuring the access of the disabled (many of whom are older persons) to all forms of transportation. The Department of Agriculture administers the Food Stamp program which many low-income elderly depend on and the donation of surplus food to the Title II nutrition program which provides hot meals five days a week to people over 60. The Veterans Administration provides retirement pensions to needy veterans and offers free hospitalization and nursing-home care to any veteran aged 65 and over.

The National Institute on Aging (NIA) was established as part of the National Institutes of Health by Congress in 1974 through the Research on Aging Act and has launched programs in biomedical research and clinical medicine, behavioral and social science research, and epidemiology, demography, and biometry (the statistics of aging).

In Congress, the Senate Special Committee on Aging, the Subcommittee on the Aged of the Senate Committee on Labor and Public Welfare, and the House of Representatives' Select Committee on

Aging initiate special studies, hold hearings, and identify new areas for legislative action. *Developments in Aging*, an annual report of the Senate Special Committee on Aging, summarizes federal department and agency activities in the area of aging.

Recent Legislation

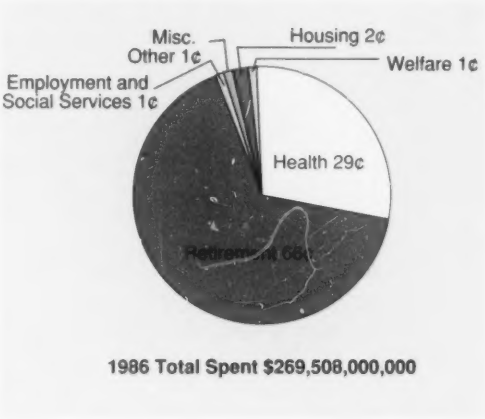
The Catastrophic Health Insurance Protection Act, passed in early June 1988, was one of the most controversial and important pieces of legislation of the 100th Congress.

It is the most significant expansion of Medicare coverage since it began in 1965, providing protection for Medicare beneficiaries against some of the dramatic costs incurred in the treatment of severe illness. This new legislation eliminates co-insurance payments paid by beneficiaries for hospital services received as well as length-of-hospital-stay requirements (currently at 60 to 150 days per illness) and provides full coverage under Medicare Part B following payment of a single deductible payment. This legislation also set a new ceiling for out-of-pocket expenditures ($1,370 per year in 1989). These new provisions are to be financed through increases in the Medicare Part B premiums and additional income-related premiums for those Medicare beneficiaries with taxable income.

A separate catastrophic prescription drug program was established. It will cover 50 percent of out-patient prescription drug costs after the first $600 paid out by the beneficiary in 1991, rising to 80 percent of all prescriptions over the deductible as of 1993.

Provisions have also been made to reduce the phenomenon of "spousal impoverishment," where, in order to be eligible for Medicaid payment of nursing home costs for an individual, the assets of both the patient and their spouse must be reduced to a minimum level. New eligibility levels have been set to allow the spouse to maintain an income up to $1,500 per month, or $18,000 per year.

Figure 12. Federal Dollar Expenditures for Senior Citizens, 1986



Source: U.S. Senate Special Committee on Aging

The new law also increases Medicare coverage for a variety of rehabilitation services, both in special facilities and through home health agencies. These provisions, however, do not cover long-term care services; reimbursement is specifically restricted to recovery and rehabilitation services following an acute illness. The only provision of the Catastrophic Health Insurance Act which refers specifically to the provision of long-term care, is that providing coverage of up to 80 hours per year of home health services as "respite" for caregivers living with dependent older people.

A proposed Medicare Long-Term Home Care Catastrophic Protection Act was defeated in the 100th Congress, but will very likely be reintroduced and passed in a modified form after the 1988 presidential election. It would, for the first time, establish at least partial Medicare coverage for long-term care.

The 100th Congress also mandated several new program areas under both state and local agencies on aging: non-medical in-home services for the frail elderly; additional assistance for the special

needs of older persons, targeted towards those with the greatest social and economic need; health education and elder abuse prevention; long-term care ombudsman services; and increased outreach to older persons eligible for, but not receiving, federal benefits such as SSI, Medicaid, and Food Stamps.

Evaluating the Public Sector Response

The above review only hints at the extent of federal involvement in programs benefiting the older population. Programs for older Americans accounted for 26 percent, or about $269.5 billion, of the federal budget in Fiscal Year 1986. As Figure 12 indicates, 95 percent of every federal dollar spent on the aged is allocated to retirement benefits (primarily through the Social Security system) and health care (primarily through the Medicare program).

Programs initiated during the New Deal of the 1930s and the Great Society of the 1960s have secured at least a minimal standard of economic well-being for most older persons. Of particular importance in this effort has been the near universal coverage of the civilian labor force by Social Security, the indexing of Social Security benefits to increases in the cost of living, and income support for the poor through the Supplementary Security Income program. A number of in-kind transfer programs, such as Food Stamps, also have played a part in this federal success story. Because of these initiatives, the economic status of the elderly appears to have improved markedly over the last 35 years. There are still deep pockets of poverty among the very old, women, and members of minority groups, however.

The other major success story of the last 30 years is in the area of programs designed to provide equal access to acute medical care services. Medicare and Medicaid together have virtually eliminated ability-to-pay as a factor in the use of acute care health services.

It is ironic, however, that the integrity of these diverse programs is threatened by their very success. The improved financial profile of the older population and their greater access to medical services suggest to some that the time may have come to redirect federal spending priorities away from categorical assistance for elders. During this decade a debate has begun which poses the fundamental question: Should benefits be made available to all elderly (categorical assistance) or should they be targeted at those most in need? The recent elimination of the standard tax deduction for those 65 and over may signal a public policy shift away from an age- and towards a needs-based system of entitlements.

Concern for the federal level of spending targeted to older people is also driven by projected increases in the absolute number of elderly and, perhaps more importantly, by the dramatic growth in the federal deficit under the Reagan Administration. Although 26 percent of the annual growth in federal spending occurs in programs that directly benefit the older population, the bulk of the deficit increase cannot be attributed to these programs. Research indicates, for example, that tax cuts, increases in defense spending, and the spiralling interest payments on the federal deficit are primarily to blame.[50] Benefits for older persons, financed largely by dedicated funds such as the payroll taxes for Medicare and Social Security, have not contributed dramatically to the growing fiscal imbalance at the federal level.

Challenges of Long-Term Care

Even with the enactment of the Catastrophic Health Insurance Protection Act described above, the greatest public sector failure is its limited response to the long-term care needs of older adults. By far the most pervasive and the most costly problem of older individuals is personal care. At $16,000 per year for home

Jill Merrick

Physical and personal assistance enables disabled elderly to remain in their community.

care and about $22,000 per year for nursing home care, even a relatively brief episode of long-term care can bankrupt most older families, whose median income in 1986 was $19,922.

Compounding the cost problems of long-term care is a fragmented approach to the delivery of personal care services. Older persons needing such help must struggle through a maze of independent applications for Medicaid, SSI, Title XX, and Title III programs. Even in those communities that make available a full range of services there is seldom a single point of entry. As the system now functions, it is the responsibility of the older individual to determine the type and frequency of the services needed, where they are available, and how best to orchestrate a comprehensive service package. Viewed from a policy perspective, this piecemeal approach to the delivery of community long-term care services encourages admissions to institutions, the majority of which ultimately are paid for by Medicaid.

To test innovative strategies for reducing rates of unnecessary nursing home use and public expenditures for long-term care, as well as improving the quality of life for the frail elderly, the federal government has funded at least 16 demonstration projects since 1970.[51] The largest of these was the 10-state Channeling project to test the use of case management services where case managers provide a central point of entry into the network of community long-term care services, both informal and formal helpers.

Cost savings, as measured in terms of aggregate expenditures for long-term care, have been trivial in most of the experimental programs. Very few were able to show significant reductions in the use or cost of nursing home services when coordinated, comprehensive service alternatives were made available in the

community. For such programs to affect cost savings, the supplemental services must be targeted at those truly at risk for admission to a nursing home. A problem is that social science research doesn't provide a reliable targeting method.[52] The alternative is expanded, reimbursable community services. A strict cost-savings criteria may not be appropriate, however, for assessing the societal worth of a comprehensive, low-cost community long-term care service system. If the non-monetary benefits to the frail seniors and their immediate families are factored in, the resulting cost-benefit ratio may indeed argue in favor of expanded reimbursements for community services.

The debate on expanded home care services will not be decided on the basis of research per se. Ultimately the public policy agenda must come to grips with the value-basis by which scarce federal resources are allocated to support the long-term well-being and satisfaction of its older citizens. In a pluralistic society such as ours, value-based conflicts can be resolved only through the workings of the political process.[53]

The ongoing debate on expanded long-term care benefits will be particularly difficult to resolve because it will be played out in the context of increasing concern over the federal deficit. Legislation authorizing new programs are evaluated in Congress today against the litmus test of self-pay funding. New coverage under the Catastrophic Health Insurance Protection Act, for example, is financed by a combination of increased Medicare premiums paid by older people and higher payroll taxes for workers earning in excess of $45,000 per year.

As the four-generation family becomes more prevalent, awareness of the issue will undoubtedly increase. Already one survey estimates that 60 percent of the adults in the U.S. have had first-hand experience dealing with the emotional and financial costs of long-term care.[54] Even in the era of deficit reduction and cost-containment, it is likely that the public sector will play an even larger role in providing comprehensive long-term care alternatives for elderly Americans.

The public policy challenges do not stem solely from the projected increase in the numbers of elderly. Of the 8.8 percent growth in personal health care spending from 1985 to 1986, for example, only 11 percent of the increase could be attributed to population changes, while price increases accounted for over half of the growth.[55]

Demographic trends superimposed on existing program commitments guarantee that public expenditures for the aged will escalate. With increasing calls for tax cuts and a balanced budget, new or expanded benefits will face tougher opposition than in the past. Indeed, the special claim the elderly have long had on public funds is being seriously challenged for the first time.

Intergenerational Equity

There is widespread support for the general notion that we have a collective obligation to provide for those who previously contributed to the growth and development of our country. At issue today, however, is the *extent* of this commitment. The competition among various groups for federal program dollars is partly due to cutbacks in domestic spending during the Reagan Administration. But there is, nonetheless, a growing perception that improved benefits for older persons have come at the expense of diminished well-being for children and middle-aged workers, raising the issue of "intergenerational inequity."

Economists estimate that government expenditures are three times greater for the elderly than for children.[56] During the 1980s, federal spending that benefits children has been reduced while spending for the older population has held constant or expanded. Samuel Preston, a former President of the Population Association of America, has estimated that per capita federal spending on children in 1984 was but 9 percent of the per capita

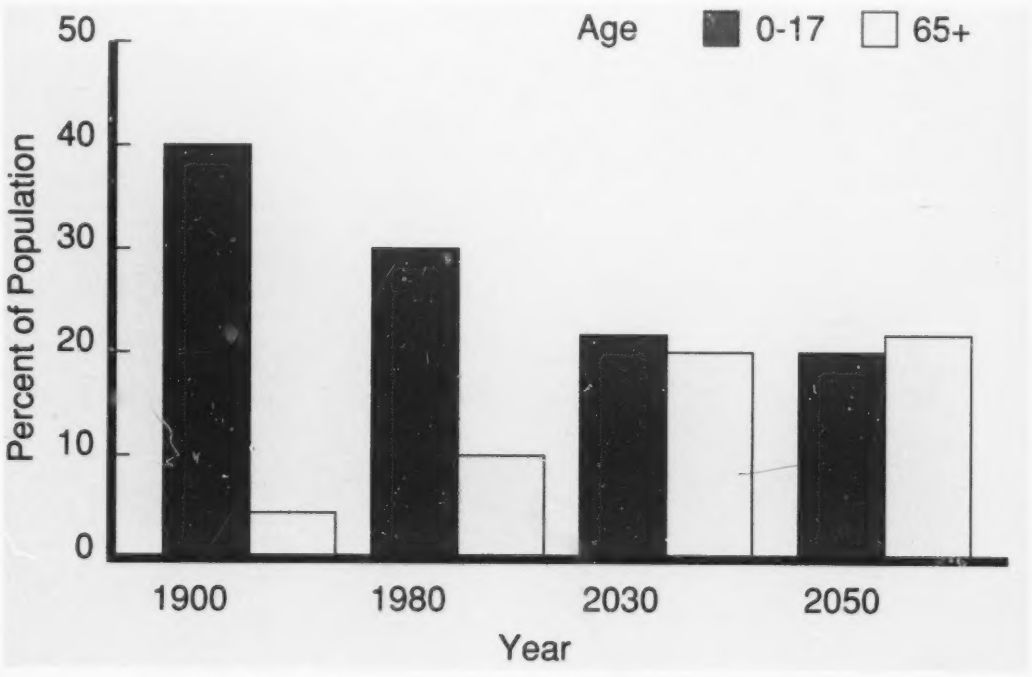
spending on the elderly.[57]

Simple comparisons between levels of federal spending targeted at specific age groups are somewhat misleading, however. Public expenditures for various age groups need to be adjusted not only for differences in the size of the different groups, but also for their profiles of need and the differential public costs incurred in meeting these needs. A recent study of the intergenerational equity issue further points out that "even if the aggregate needs of each group were the same, equal per capita expenditures directed at children and the elderly in the face of substantial unmet needs are not the same as social justice, nor would they result in equal outcomes."[58] In addition, it also is important to note that parents absorb many of the costs of raising a child themselves, while most of the costs of supporting the elderly are borne by the public sector.

Nonetheless, it is clear that we as a society are falling short of providing for the general welfare of many of the nation's children. Poverty rates for children under 18 years of age have increased even as the rates for older people have declined. Hispanics and black children and those living in female-headed households have particularly high poverty rates. These problems persist even though most would agree that investing in our children "is an intergenerational compact that protects our future security."[59]

Central to the intergenerational equity debate are Social Security taxes. In 1986, workers contributed 5.7 percent of all earnings (up to $42,000 in wages) to the various Social Security Trust Funds. Contrary to popular misconception, these payroll deductions were not deposited into individual accounts for the eventual retirement of the contributing workers. The Social Security system is not an annuity system but a program of direct,

Figure 13. Distribution of Children and Elderly: 1900-2050



Source: U.S. Bureau of the Census

structured intergenerational transfers. Most of the $215.5 billion paid by about 122 million workers in 1986 went to provide monthly benefits to 23.3 million retirees and 2.8 million disabled workers.

During the early 1980s, the future viability of the Social Security system was at the center of a national debate. There were projections that combined employer-employee tax rates could climb to somewhere between 25 percent and 45 percent by 2030. In response, a series of Amendments to the Social Security Act were passed in 1983 that ensure the solvency of the system for at least the next 75 years. Among the changes legislated were a scheduled increase in payroll deductions (in 1990, for example, employees will be taxed at a rate of 7.65 percent) and a gradual increase in the full-benefit retirement age (from age 65 to age 67 by 2026).

The direct effect of these changes will be to increase the financial "burden" on workers in the short run and to delay their claim on retirement benefits in the long run. Many American workers wonder whether they will ever benefit from Social Security.

Analyses indicate that such fears are largely unfounded. Although the relative number of retirees to workers will increase as the baby-boom cohorts begin to leave the labor force, the solvency of the system will not be threatened if there continues to be relatively modest growth in real wages and productivity.[60] The purchasing power of the retirement benefit paid to tomorrow's older population also is projected to be greater. Furthermore, gains in old-age life expectancy may offset some of the postponement in claiming retirement benefits.

But intergenerational equity is more than a strict accounting of the costs and benefits to different age groups that flow from federal programs. It is quite literally a framework for viewing policy choices in terms of the welfare of various generations. As such, it presumes competition and forecasts conflict. Inherent in this framework are the questionable assumptions that total federal revenues are fixed and that increased spending for one group can only come at the expense of the needs of other groups. In general, the intergenerational equity issue distracts attention from other, potentially more useful ways of organizing the policy debate in an era of concern for deficit reductions.

Fundamental to understanding the intergenerational issue is the *interdependence* that exists between the generations over time. As illustrated in Table 13, page 40, there is a natural rhythm to the life course in which different stages are characterized alternately by dependence and independence. Over our lives, we all benefit from and contribute to the transfers—both public and private—that assure the continuity of society. The benefits of intergenerational transfer are direct and indirect. The generation that is currently elderly benefits directly from Social Security transfers. But so do their children. If Social Security were to cease tomorrow, it has been estimated that the poverty rate of the older population would jump to 50 percent. A large number of working families would be faced with the difficult choice of letting their older parents live in abject circumstances or allocating some of their own household income directly to them.

The Social Security system of structured transfers protects young and middle-aged families from the unpredictable and, at various points, large financial transfers necessary to privately support their older parents. Workers also benefit indirectly to the extent that employment and promotion opportunities become available as older workers leave the labor force in exchange for a pension.

Financing Long-term Care

The intergenerational equity argument is most likely to come up in the next decade with respect to the financing of long-term care for the elderly. The Congressional Budget Office estimates that total spend-

Table 13. Illustrations of Intergenerational Transfers

	Intergenerational Transfers Given					Intergenerational Transfers Received				
	Children 0-15	Youth 16-22	Adults	Elderly 65+	Functionally disabled	Children 0-15	Youth 16-22	Adults	Elderly 65+	Functionally disabled
Private transfers										
Child care		★	■	★		■	■			
Adult care		★	■	★				★	★	■
Family financial support			■	★		■	■	★	★	★
Inheritances				■	★	★	★	★		
Public transfers										
Education			★	★	★	■	■			★
Social Security			■	★	★	★	★	★	■	■
Health care programs			■	★		★	★	★	■	■
Public infrastructure			■	★	★	★	★	★	★	★
Societal transfers										
Economic growth		★	■	★		★	★	★	★	★
Knowledge, technology			★	★	★	★	★	★	★	★
Culture		★	★	★	★	★	★	★	★	★
Environment			★	★		★	★	★	★	★
National defense		★	★	★		★	★	★	★	★

★ Identifies transfer received or given.
■ Identifies transfer targeted on a particular group or for which the provider makes a particular contribution.

Note: This chart provides illustrations in intergeneraticnal transfers typically given and received over the course of life. Clearly there is much variation within each of the groups listed and so the chart should be viewed as simply presenting broad generalizations.

Source: Kingson, Eric R., Barbara A. Hirshorn, and John M. Cornman, *Ties That Bind: The Interdependence of Generations*. (Washington DC: Seven Locks Press, 1986). Reprinted with permission from Seven Locks Press.

ing on formal long-term care in 1985 was $44.9 billion. The private (48 percent) and public (52 percent) sectors share about equally in meeting the costs of long-term care for the older population. Out-of-pocket expenditures by older people themselves and their families account for 44 percent of total spending. Other private spending, for example, through private insurance companies, accounts for only 3 percent of the total.

Most public spending of long-term care—81 percent—is for care in nursing homes. Contrary to what many Americans believe, Medicare does not cover the cost of nursing home care in most circumstances. Rather, the means-tested Medicaid program is the primary source of public funding for nursing homes. In 1987, Medicaid nursing home payments of $13.3 billion accounted for 42 percent of all spending for that type of care. The proportion of nursing home care paid for directly by private sources increased by about 20 percent from 1975 to 1985, while the relative share of nursing home costs paid for by Medicaid decreased. The U.S. Senate Special Committee on Aging points out that "while the amount that Medicaid pays for nursing home care has been increasing (306 percent between 1975 and 1985), the amount paid out-of-pocket has been increasing at a faster rate—420 percent between 1975 and 1985."[61]

Most older persons enter nursing homes as private, paying patients. But at an average monthly cost of almost $2,000, many quickly exhaust their entire savings. In doing so, as many as two-thirds of all older nursing home residents eventually "spend down" to the point they are eligible for Medicaid. Half of all the older individuals who enter nursing homes deplete their available savings and convert to Medicaid in the first six months of their stay.

The national spending total for formal

long-term care services in the community or the nursing home does not include the value of in-kind informal services. In 1982, using only the minimum wage rate to assign a market value to the extra hours of care provided by adult children, the per capita value of such care was estimated at $4,529.[62] Undoubtedly, if the value of all informal care was factored into the national account, the share provided by the older population and their families would be considerably higher than the $21.3 billion estimated.

But the monetary cost of long-term care, as significant a share of the federal budget as it is, will not be the only factor compelling increased policy discussion. Congress is regularly hearing testimony from family caregivers about the emotional burden and strain they encounter in providing care to their older relatives. This is not surprising since informal, nonprofessional helpers spend an average of four extra hours a day meeting the needs of frail older people. Most helpers provide care for one to four years, and one-fifth provide care for over five years.[63]

Commitments to help older parents, parents-in-law, and even grandparents are not necessarily coincident. As the number of four-generation families increase, it may not be uncommon for adult children to spend most of their mid-life assisting their older relatives in some way.

While most informal caregivers provide assistance willingly, and many report that their disabled relatives are a source of companionship for them, a majority report increased levels of stress and strain. Common problems include a lack of free time, reduced privacy, difficulty dealing with the more onerous aspects of caregiving such as incontinence and the behavioral problems associated with senility, as well as simple fatigue. When the demands of caregiving become too great, relief is usually sought by placing the individual needing care in a nursing home.

Debate will likely center on ways to underwrite the cost of expanded long-term care under either Medicare or Medicaid. Among the options being discussed are increasing the Medicare payroll tax, lifting the $45,000 cap on earnings currently subject to the 1.45 percent Medi-

ACTION/Reinhard

Older volunteers at juvenile detention center in Augusta, Georgia.

care payroll tax, and imposing a "sin" tax on alcohol and cigarettes. In addition, it appears likely that a prospective payment system similar to that used to contain Medicare costs for acute hospitalizations will be instituted to control the growth of public sector expenditures for nursing homes.

Strategies also are being discussed to encourage private sector financing of long-term care. Private insurance has not, to date, played a large role in protecting the older population and their families against the financially devastating costs of disability. An option being considered is using home equity conversion to finance the costs of long-term care. As noted above, most elderly people are homeowners and nearly eight out of ten own their homes mortgage-free. Economists estimate that older people have claim to about $630 billion in home equity at the present time. Unlocking this equity could permit the older resident to remain in the dwelling, while purchasing needed services. Demonstration home equity programs have not met with great success, however. Life care communities are another private sector option. But with entrance fees that range from $40,000 to over $150,000 and monthly fees of between $500 and $2,000, only a few affluent elderly can afford them.

Public sector involvement in the financing of long-term care seems destined for expansion. Many analysts believe that public initiatives for financing long-term care will ultimately include a mix of home-health services (monitored by case managers) and tax incentives for private long-term care savings as well as employer-sponsored insurance programs. Reimbursements to nursing homes in the future are likely either to be linked to care outcomes or regulated under some sort of prospective payment system geared to a range of care needs among older individuals.

Conclusion

The unprecedented increase in the number of older people and the rapidity of the growth in their share of total population in almost every country as well as in the United States, is a new social phenomenon, offering both problems and opportunities. The challenge is to make a longer life also a better life. □

AARP

References

1. Coale, Ansley J., "How a Population Ages or Grows Younger," in R. Fredman, ed., *Population: The Vital Revolution* (Garden City, NJ: Anchor Boooks, 1964).
2. Omran, Abdel R., "Epidemiologic Transition in the U.S.," *Population Bulletin*, Vol. 32, No. 2 (Washington, DC: Population Reference Bureau, Inc., May 1980 updated reprint).
3. Haub, Carl and Machiko Yanagishita, *1988 World Population Data Sheet* (Washington, DC: Population Reference Bureau, Inc., 1988).
4. Krucoff, Carol,"Coping: The Plight of Women in a Graying America," *Washington Post*, May 6, 1980, p. B5.
5. Crimmins, Elaine, "Implications of Recent Mortality Trends for the Size and Composition of the Population Over 65," *Review of Public Data Use*, Vol. 11, No. 1 (January 1983).
6. U.S. Bureau of the Census, "America's Centenarians: Data from the 1980 Census," *Current Population Reports*, Series P-23, No. 153 (Washington, DC: Government Printing Office, September 1987).
7. Rosenwaike, Ira and Arthur Dolinsky, "The Changing Demographic Determinants of the Growth of the Extreme Aged," *The Gerontologist*, Vol. 27, No. 3 (June 1987).
8. National Center for Health Statistics, *Health, United States 1987*, Public Health Service, DHHS Pub. No. PHS 88-1232 (Washington, DC: Government Printing Office, March 1988).
9. Biggar, Jeanne C., Charles F. Longino, Jr. and Cynthia B. Flynn, "Elderly Interstate Migration: The Impact on Sending and Receiving States, 1965-1970," *Research on Aging*, Vol. 2, No. 2 (1980) p.175.
10. Serow, William J. and D. F. Sly, "Consequences of Elderly Migration in the United States," in U.S. Department of Health and Human Services, *Data for an Aging Population*, Proceedings of the 1987 Public Health Conference on Records and Statistics. DHHS Pub. PHS 88-1214 (Washington, DC: Government Printing Office, 1987)
11. Litwak, Eugene and Charles F. Longino, Jr., "Migration Patterns Among the Elderly: A Developmental Perspective," *The Gerontologist*, Vol. 27, No. 3 (June 1987).
12. Social Security Administration, Office of the Actuary, personal communication, June 1988.
13. Social Security Administration, Office of the Actuary, *Social Security Area Population Projections, 1987*, Actuarial Study No, 99, SSA Pub. 11-11546 (Washington, DC: Government Printing Office, 1987).
14. Manton, Kenneth G. and George C. Myers, "Recent Trends in Multiple-Caused Mortality, 1968 to 1982: Age and Cohort Comparisons," *Population Research and Policy Review*, Vol. 6, No. 2 (1987) p. 173.
15. Soldo, Beth J. and Kenneth G. Manton, "Changes in the Health Status and Service Needs of the Oldest Old: Current Patterns and Future Trends," *Milbank Memorial Fund Quarterly*, Vol. 63, No. 2 (Spring 1985).
16. Raskind, Murray A. and Michael C. Storrie, "The Organic Mental Disorders," in E. W. Busse and D. G. Blazer, eds., *Handbook of Geriatric Psychiatry* (New York: Van Nostrand Reinhold, 1980), p. 305.
17. National Center for Health Statistics, "Aging in the Eighties: Functional Limitations of Individuals 65 Years and Older," *Advancedata* No. 133 (Washington, DC: Government Printing Office, 1987).
18. Manton, Kenneth G., "Planning Long-term Care for Heterogeneous Older Populations," in *Annual Review of Gerontology and Geriatrics* (New York: Springer, in press).
19. Liu, Korbin and Kenneth G. Manton, "Long-term Care: Current Estimates and Projections," in DHHS, *Data for an Aging . . . .*
20. U.S. Senate, Special Committee on Aging, "The Long-term Care Challenge," in *Developments in Aging: 1987*, Vol. 3 (Washington, DC: Government Printing Office, 1987).
21. Manton, Kenneth G., "The Interaction of Population Aging and Health Transitions at Later Ages: New Evidence and Insights," in Carl J. Schramm, ed., *Health Care and Its Cost* (New York: W. W. Norton and Co., 1987).
22. Katz, Sidney, "Assessing Self-Maintenance: Activities of Daily Living," *Journal of the American Geriatric Society*, Vol. 31 (1983).

23. Strehler, B. L., "Implications of Aging Research for Society," in *Proceedings, 58th Annual Meeting of the Federation of American Societies for Experimental Biology*, Vol. 34, 1975; and Walford, R., "Testimony before the Subcommittee on Savings, Pensions, and Investment Policy of the Committee on Finance," Senate Hearing Document No. 98-359 (Washington, DC: U.S. Senate Committee on Finance, 1983).
24. Gruenberg, Ernest M., "The Failure of Success," *Milbank Memorial Fund Quarterly*, Vol. 55, No. 1 (Winter 1977); and Kramer, M., "The Increased Prevalence of Mental Disorders: Implications for the Future," paper presented at the National Conference on the Elderly Institutionalized Patient in the Community, Arlington VA, 1981.
25. Fries, James F., "Aging, Natural Death and the Compression of Morbidity," *New England Journal of Medicine*, Vol. 303, No. 11 (1980); and Fries, James F., "The Compression of Morbidity," *Milbank Memorial Fund Quarterly*, Vol. 61, No. 3 (Summer 1983).
26. Manton, Kenneth G., "Changing Concepts of Morbidity and Mortality in the Elderly Population," *Milbank Memorial Fund Quarterly*, Vol. 60, No. 2 (Spring 1982); and Manton, Kenneth G. and Beth J. Soldo, "Dynamics of Health Changes in the Oldest Old: New Perspectives and Evidence," *Milbank Memorial Fund Quarterly*, Vol. 63, No. 2 (Spring 1985).
27. Wilkins, R. and O. B. Adams, *Healthfulness of Life* (Montreal: Institute for Research on Public Policy, 1983).
28. U.S. Bureau of the Census, "Computer Use in the United States: 1984," *Current Population Reports*, Series P-23, No. 155 (Washington, DC: Government Printing Office, March 1988) p. 14.
29. Schulz, James, *Economics of Aging*, 4th edition (Dover, MA: Auburn House Publications, 1988).
30. U.S. Senate, Special Committee on Aging, *Developments in Aging: 1987*, Vol. 1 (Washington: DC: Government Printing Office, 1988) p. 131.
31. Avery, R. B., G. E. Elliehausen, G. B. Canner and T. A. Gustafson, "Survey of Consumer Finances, 1983," *Federal Reserve Bulletin*, Vol. 70, No. 4 (1984).
32. *Ibid.*
33. U.S. Census Bureau, personal communication, advance data from the 1987 Current Population Survey.
34. U.S. Senate, Special Committee on Aging, *Developments . . . 1987*, Vol. 3.
35. National Center for Health Statistics, *Health Statistics on Older Persons; United States, 1986*, Vital and Health Statistics, Series 3, No. 25, DHSS Pub. No. (PHS) 87-1409 (Washington, DC: Government Printing Office, June 1987), and *Aging America*, the U.S. Senate Special Committee on Aging in conjunction with the American Association of Retired Persons, the Federal Council on the Aging, and the U.S. Administration on Aging.
36. Goldstein, Arnold A. "How Are the Elderly Housed? New Data from the 1984 Survey of Income and Program Participation," paper presented at the Annual Meeting of the Population Association of America, New Orleans LA, April 1988.
37. Soldo, Beth J. and Charles F. Longino, Jr. "Social and Physical Environments for the Vulnerable Aged," in William Bell and Quita Bond, eds., *America's Aging: The Social and Built Environment of an Aging Society* (New York: Academic Press, in press).
38. Myers, George C. and Barbara Foley Wilson, "Marriage and Divorce Trends and Patterns Among Older Americans," paper presented at the Annual Meeting of the Population Association of America, New Orleans LA, April 1988.
39. Mindel, Charles N. "Multigenerational Family Households: Recent Trends and Implications," *The Gerontologist*, Vol. 19, No. 5 (October 1979).
40. National Center for Health Statistics, "Aging in the Eighties, Age 65 and Over and Living Alone, Contacts with Family, Friends, and Neighbors," *Advancedata* No. 116 (Washington, DC: Government Printing Office, 1986).
41. Soldo, Beth J., Mahesh Sharma and Richard T. Campbell, "Determinants of Community Living Arrangements of Older Unmarried Women," *Journal of Gerontology*, Vol. 39, No. 4 (1984).
42. National Center for Health Statistics, "Aging in the Eighties, People Living Alone—Two Years Later: Data from the 1984 and 1986 Longitudinal Study of Aging," *Advancedata* 149 (Washington, DC: Government Printing Office, 1988).
43. National Center for Health Statistics, *Health, 1987* . . .

44. Cohen, Marc, Eileen Tell and Stanley Wallack, "The Lifetime Risks and Costs of Nursing Home Use Among the Elderly," *Medical Care*, Vol. 24, No. 12 (1987); and Liang Jersey and Edward Jow-Ching Tu, "Estimating Lifetime Risk of Nursing Home Residency: A Further Note," *The Gerontologist*, Vol. 26, No. 5 (October 1986).
45. Liu and Manton, "Long-term Care.." in DHSS, *Data for Aging . . .*; National Center for Health Statistics, *Health 1987*; and Soldo and Manton, "Changes . . . " *Milbank*.
46. Shanas, Ethel, "The Family as Support System in Old Age," *The Gerontologist*, Vol. 27, No. 5 (October 1979).
47. Soldo, Beth J., Emily M. Agree and Douglas Wolf, "The Balance Between Formal and Informal Care," in Marcia G. Ory and Kathleen Bond, eds., *Aging and Health Care: Social Science and Policy Perspectives* (Boston: Routledge Publications, in press).
48. Stone, Robyn, Gail Lee Cafferata, and Judy Sangl, "Caregivers of the Frail Elderly: A National Profile," *The Gerontologist*, Vol. 27, No. 5 (October 1987).
49. U.S. Senate, Special Committee on Aging, *Developments . . . 1987*, Vol. 1, p. 37.
50. Storey, James R., "Policy Changes Affecting Older Americans During the First Reagan Administration," *The Gerontologist*, Vol. 26, No. 1 (February 1986).
51. Kemper, Peter, Robert Appelbaum and Margaret Harrigan, "Community Care Demonstrations: What Have We Learned," *Health Care Financing Review*, Vol. 8, No. 4 (1987); and Liang, Jersey and Edward Jow-Ching Tu, "Estimating . . .," *The Gerontologist*.
52. Soldo and Manton, "Changes . . . " *Milbank*
53. Soldo, Beth J., Edmund D. Pellegrino and James T. Howell, "Epilogue: Confronting the Age of Aging," *Socio-Economic Planning Sciences*, Vol. 19, No. 4 (1985).
54. R.L. Associates, "The American Public Views Long-term Care," (Princeton, NJ: 1987).
55. National Center for Health Statistics, *Health, 1987 . . .*
56. Clark, Robert and Joseph Spengler, "The Implications of Future Dependency Ratios and Their Composition," in Barbara P. Herzog, ed., *Aging and Income* (New York: Human Sciences Press, 1978).
57. Preston, Samuel H., "Children and the Elderly: Divergent Paths for America's Dependents," *Demography*, Vol. 21, No. 4 (November 1984).
58. Kingson, Eric R., Barbara A. Hirshorn and John M. Cornman, *Ties That Bind: The Interdependence of Generations* (Washington, DC: Seven Locks Press, 1986) p. 7.
59. Children's Defense Fund, *A Children's Defense Fund Budget: An Analysis of the President's FY 1986 Budget and Children* (Washington, DC: 1985) p. 71.
60. U.S. Senate, Special Committee on Aging, *Developments . . . 1987*, Vol. 1.
61. *Ibid.*, p. 37.
62. Doty, Pamela. "Family Care of the Elderly: The Role of Public Policy," *Milbank Quarterly*, Vol. 64, No. 1 (1986).63. Stone *et al*, op. cit.

Further Reading

In addition to the material cited above, the following publications will be of interest to those wishing to learn more about the elderly.

Birren, Robert H. and V. L. Bengston, eds., *Emergent Theories of Aging* (New York: Springer, 1988).

Callahan, Daniel, *Setting Limits* (New York: Simon and Schuster, 1987).

Cherlin, Andrew and F. F. Furstenberg, *The New American Grandparent: A Place in the Family, A Life Apart* (New York: Basic Books, 1986).

Committee on an Aging Society, Institute of Medicine and National Research Council, *America's Aging: Health in an Older Society* (Washington, DC: National Academy Press, 1985).

____, *America's Aging: Productive Roles in an Older Society* (Washington, DC: National Academy Press, 1986).

Daniels, Norman, *Am I My Parent's Keeper? An Essay on Justice Between the Young and the Old* (New York: Oxford University Press, 1988).

Lesnoff-Caravaglia, G., *Values, Ethics, and Aging*, Vol. IV, Frontiers in Aging Series (New York: Human Sciences Press, Inc., 1985).

Markides, Kyriakos S., "Minority Aging" in Matilda Wright Riley, Beth B. Hess and Cathleen Bond, Eds., *Aging in Society: Selected Reviews of Recent Research* (Hillsdale, NJ: Lawrence Erlbaum Associates, 1983).

Martin, Linda G., "The Aging of Asia," *The Journal of Gerontology*, Vol. 34, No. 4 (1988).

Pifer, Alan and Lydia Bronte, eds., *Our Aging Society: Paradox and Promise* (New York: W. W. Norton and Company, 1986).

Sheehan, Susan, *Kate Quinton's Days* (New American Library, 1985).

Treas, Judith and Barbara Logue, "Economic Development and the Older Population," *Population and Development Review*, Vol. 12, No. 4 (1986).

Further Discussion Points

1. Explain how the U.S. elderly population has changed in absolute and relative size since 1900 and how it is projected to change in the future. Compare this to the past and expected changes in the overall population.

2. What effects do changes in fertility, mortality, and migration have on the size and proportion of elderly in a population?

3. Discuss migration patterns among the elderly (both the young-old and the old-old) and their effects on both sending and receiving communities. Also consider the effect that migration in other age groups may have on a community's elderly population.

4. Reductions in mortality first benefited the very young. Recent changes have affected older ages. Discuss changes in causes of death and show how these changes have affected life expectancy at various ages.

5. Discuss differences between male and female elderly in terms of income, living arrangements, type of care received, etc.

6. The authors state: ". . . while the average age at death is being pushed back, the length of the period spent sick and disabled prior to death may be increasing." Three theories, the "Life Span Expansion" theory, the "Pandemic of Chronic Disease and Mental Disorders" approach, and the "Compresion of Morbidity" theory, are then presented. Consider the socioeconomic effects and policy implications of each theory.

7. Explain intergenerational transfers. How do intergenerational transfers affect the elderly, younger generations, and society?

8. Consider the impact that changes in female labor force participation may have on the elderly.

9. Track the baby-boom generation from 1950 to 2050. Consider the role they play in supporting today's elderly and what will happen when they become elderly.

10. Why has aging raised issues about "quality of life" vs. "prolongation of life"? What is involved in considering these issues?

Prepared by Kimberly Crews

Aging in International Perspective

Societal aging is not unique to the U.S. nor even to the countries of Western Europe. The older population is increasing throughout the world. The world's elderly population is growing faster (at 2.4 percent) than total global population.[1] In the next 15 years alone, the number of older persons throughout the world will increase from 290 million to 410 million.

Most of this growth will be concentrated in developing countries. Slightly more than half of the world's elderly live in developing countries; by the turn of the century, these countries will claim 59 percent; 25 years later, it will be seven out of ten. Both the pace and sheer volume of increase in older people in countries such as China, India, Brazil, and Bangladesh are unprecedented. So, too, will be the strain on the already limited economic bases of these countries, as the needs of large numbers of elders compete with human capital investments in education, child health, and other expenditures that promote economic development.

True population aging—as measured by the proportion of aged in a population—will occur at a far slower rate in the developing countries. In general, less developed countries have young age structures. In countries such as Mexico, the Philippines, and Nigeria, no more than 4 percent of the population is aged 65 and over; in contrast, 15 percent or more is aged 65 or over in Sweden, France, and West Germany.

At present, the Caribbean countries have the oldest age structure in the Third World. But if current trends continue, a number of developing countries, including China, Singapore, Sri Lanka, and Uruguay will have age structures in which at least 10 percent of the population is 65 and over by the year 2025. Japan is likely to be the "oldest" country in the world by 2020 when nearly one-quarter of its population will be elderly and its median age will be about 45 years.[2]

Of the developing countries, those of East Asia are expected to age most rapidly. This is because of their recent dramatic fertility declines and higher life expectancy. Average life expectancy at birth among the countries of East Asia is now 67 years, in contrast to 51 years in Africa. In addition, crude birth rates in East Asia average 20 per thousand, while in Africa they average 44.

Although 65 is used to distinguish the "older" population in the United States, in discussions of international trends in aging, 65 years is quite arbitrary. Social and cultural factors, along with wide variation in life expectancy affect the timing of life-course transitions and therefore definitions of who is "old." The United Nations, for example, refers to those aged 60 and over as the elderly.

As the figure shows, Sweden is the world's "oldest" country. Its older population has been increasing gradually since the early 19th century. In general, Scandinavian and Western European countries have the highest proportions of elderly in their populations, while nations of Africa and the Arab Middle East are the "youngest."

Care of the Elderly in Developed Countries

Developed countries share an approach to providing care and well-being for their elders, based on the principle of structured, intergenerational transfers. All developed countries provide some type of public retirement benefit system. Public spending on the older population varies from country to country, reflecting differences in eligibility requirements, benefit levels, and the absolute number of older people within the population.

In 1981, between 11 and 13 percent of the Gross National Product (GNP) of

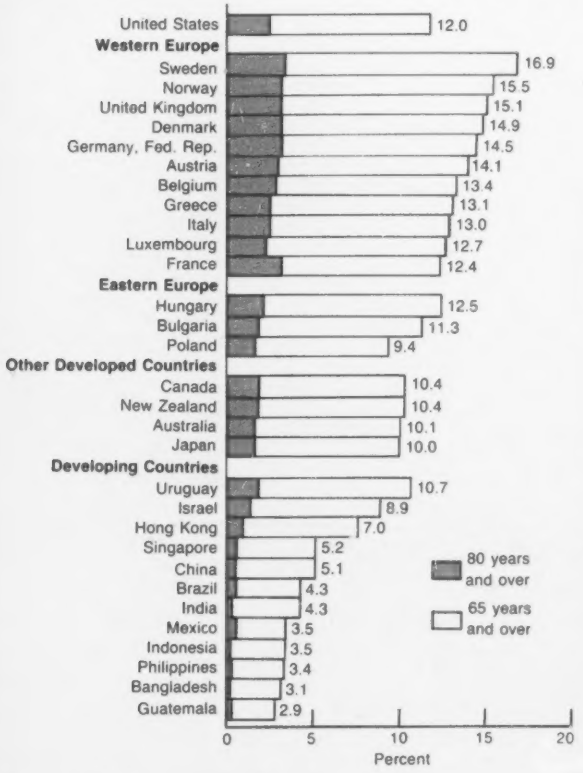
countries in Western Europe was spent on social insurance programs, ranging from 21 percent in Austria to 8 percent in Norway. By contrast, the U.S. spent about 7.4 percent of its Gross Domestic Product on comparable programs in 1981. U.S. expenditures on pensions are about average for a highly industrialized nation. Projected increases in these expenditures are a function of increases in the size of the older population and trends in the labor force participation rates of older people. Japan, for example, is anticipating huge increases in the costs of its public pension system, driven mostly by a twofold increase in the relative number of older people. Compared to other developed countries, however, Japan had fairly high proportions of older men (46 percent) and older women (16 percent) in the labor force.

Developed countries generally have some type of supplementary security income program which augments pension benefits for the needy. They also provide health care benefits for the older population and specialized health care services. The United States lags far behind in the training of geriatricians and providing specialized geriatric care in community settings.

Though social services for the elderly are available in all developed countries, approaches and organizations of services vary widely. Western European countries tend to favor supportive, personal care services. In most cases, the needs of the frail elderly are met by a mix of institutional care, formal care services in the community, and informal care provided by family and friends. It is difficult to compare rates of institutionalization, however, because the definition and scope of institutional care varies. Rates of institutionalization among the developed countries range from about 2 percent in Japan to 10 percent in the Netherlands.[3]

In developed countries, the family, including adult children, are actively involved in assisting older relatives with the basic activities of daily living. In the U.S., such informal care is provided without compensation or compulsion. In other countries, notably Scandinavia and Great Britain, relatives can be compensated at a relatively low rate for the services they provide to frail elders. Still other Western developed countries provide financial incentives (e.g., tax deductions) or service supports to those who care for older par-

Elderly Population, 1985



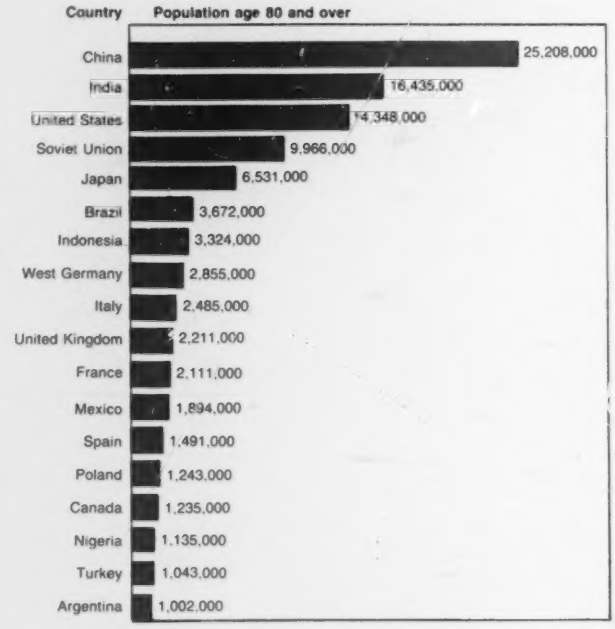
Source: U.S. Bureau of the Census

ents. More common in the developed countries of Eastern Europe are privileged pension benefits (e.g., earlier retirement) or those who assist in the care of older relatives.

In comparison to expenditures for institutional, or "closed" care, public financing of supportive services in the community is limited. In Sweden, which has one of the more progressive systems of public benefits for the aged, only 10 percent of elders in the community receive such care.

In the developed countries as a whole, there is a fairly clean-cut division between the service responsibilities of the government and the private sector, particularly the family. Public funds are used primarily to provide income maintenance, medical care, and housing services. Nonmedical care, especially non-institutional personal care, remains in the extended family's realm of responsibility.

Countries Projected to Have Over 1 Million Octogenarians in 2025



Source: United Nations; U.S. Bureau of the Census

Care in Developing Countries

National programs for older populations are limited in number and scope in less developed countries. Economic security is not a universal entitlement of the aged in these countries. Retirement benefits are usually available only to select subgroups who were salaried employees in industry or government service. For example, only about 8 percent of the population aged 65 and over in India and the Philippines are covered by the national pension system.[4]

In general, older people in the Third World depend on kin for all aspects of both economic and social security. It is not uncommon for families to provide food, clothing, bedding, and personal care to older hospitalized relatives. Institutionalizaton of the aged is at the same time economically infeasible and culturally taboo, particularly in Asian countries and the Arab world. Homes for the elderly are few in number and usually reserved for the disadvantaged and childless.

The traditional notions of filial obligation create special problems in the developing countries that have begun the transition to modern economies. Declines in fertility and rapid urbanization deplete the number of potential caregivers available to rural elders. Co-residence with adult children is de-

clining rapidly, even in such family-centered countries as Korea.[5] Other developing countries have attempted to shore up century-old traditions of caring for older people. The Marriage Law of 1980, for example, grants Chinese parents who cannot care for themselves the right to demand assistance from their adult children.

Very few developing countries have an established infrastructure to organize and administer large programs for the aged. In many countries, services for the aged are "piggy-backed" onto the well-organized family planning organizations, as in Indonesia.

Continuing rapid population growth and consequent demands on limited national resources severely inhibit governments' capacity to finance programs for their older populations. "Countries in South America appear to offer the most widesprad benefits, with many countries having legislation intended to protect their older rural as well as urban population."[6]

The most dramatic example of the side effects of a successful family planning policy may be in the People's Republic of China where, if the implementation of the "one-child policy" is effective, 40 percent of their population will be 65 or over by the middle of the next century. Regardless of future fertility, China is expected to have nearly 300 million persons aged 60 and over by 2025, more than three times the current number, 92 million in 1988.

References

1. U.S. Bureau of the Census, *An Aging World,* International Population Reports, Series P-95, No. 78 (Washington, DC: Government Printing Office, 1987).
2. Kuroda. Toshio, "Population Aging in Japan, With Reference to China," *Asia-Pacific Population Journal,* Vol. 2, No. 3 (1987).
3. Cantor, Marjorie and Virginia Little, "Aging and Social Care," in Robert H. Binstock and Ethel Shanas, eds., *Handbook of Aging and the Social Sciences,* second edition (New York: Van Nostrand Reinhold, 1985).
4. Abaya, Adel G., "The Elderly in the Philippine Population," in *The Elderly of Asia* (Manila, Social Resea ch Center, University of San Tomas, 1982).
5. Ahn, Kyeong-Ryel, "The Situation of the Aging in Korea," in *Ibid.*
6. Kinsella, Kevin G., "Aging in the Third World," U.S. Bureau of the Census, Center for International Research, Staff Paper No. 35 (Washington, DC: Government Printing Office, 1988).

Recent Population Bulletins and Bulletin Slides

Population Bulletin prices: single issue, $5, prepaid; bulk order prices on request to: Population Reference Bureau, Inc., Circulation Department, 777 14th Street N.W., Washington, D.C. 20005; Telephone: (202) 639-8040. **Bulletin Slides:** Sets of 35mm colored slides for figures and tables appearing in a *Population Bulletin* are available at the *additional* prices shown in parentheses.

Volume 43 (1988)

America's Elderly, by Beth J. Soldo and Emily M. Agree — No. 3
Food and Population: Beyond Five Billion, by Peter Hendry — No. 2
Demographics: People and Markets, by Thomas W. Merrick and Stephen J. Tordella — No. 1

Volume 42 (1987)

Understanding Population Projections, by Carl Haub — No. 4
Redefining Procreation: Facing the Issues, by Stephen L. Isaacs and Renee J. Holt — No. 3
Population, Resources, Environment: An Uncertain Future, by Robert Repetto — No. 2
Europe's Second Demographic Transition, by Dirk J. van de Kaa
(22 slides, including map, $11.00) — No. 1

Volume 41 (1986)

Immigration to the U.S.: The Unfinished Story, by Leon F. Bouvier and Robert W. Gardner — No. 4
Population Pressures in Latin America, by Thomas W. Merrick, with PRB staff
(three explanatory boxes, $7.00) — No. 3
World Population in Transition, by Thomas W. Merrick, with PRB staff. January 1988 reprint — No. 2
Demographics and Housing in America, by George Sternlieb and James W. Hughes
(21 slides, $10.50) — No. 1

Volume 40 (1985)

Poverty in America: Trends and New Patterns, by William P. O'Hare. March 1987 updated reprint — No. 3
Adolescent Fertility: Worldwide Concerns, by Judith Senderowitz and John M. Paxman
(13 slides, $6.50) — No. 2

Volume 39 (1984)

Understanding U.S. Fertility: Findings from the National Survey of Family Growth, Cycle III, by William F. Pratt et al.
(30 slides, $15.00) — No. 5
Delayed Childbearing in the U.S.: Facts and Fictions, by Wendy H. Baldwin and Christine Winquist Nord
(17 slides, $8.50) — No. 4
The Business of Demographics, by Cheryl Russell — No. 3
Israel's Population: The Challenge of Pluralism, by Dov Friedlander and Calvin Goldscheider
(15 slides, including map, $7.50) — No. 2
Planet Earth 1984–2034: A Demographic Vision, by Leon F. Bouvier — No. 1

Send orders with checks to: Population Reference Bureau, Inc.
Circulation Department
P.O. Box 96152
Washington, D.C. 20090-6152

Population Reference Bureau, Inc.

PRB gathers, interprets, and disseminates information on the facts and implications of national and world population trends. Founded in 1929, it is a private, nonprofit educational organization that is supported by grants and contracts, individual and corporate contributions, memberships, and sales of publications. It consults with other groups in the United States and abroad, operates information and library services, and issues the publications described on the outside back cover. PRB also assists the development of population education through formal and nonformal programs.

Officers

*Joseph L. Fisher, *Chairman of the Board*
*Thomas W. Merrick, *President*
*Frances Garcia, *Secretary of the Board*
Bert T. Edwards, *Treasurer of the Board*

Trustees

Virginia R. Allan
Jodie T. Allen
*Michael P. Bentzen
Nancy Birdsall
*Barry C. Bishop
Ellen S. Blalock
Rodrigo Botero
*Emily DiCicco
Lenneal J. Henderson, Jr.
F. Ray Marshall
Jessica T. Mathews
Anne Firth Murray
Laura Olson
Robert Parke
Peter H. Raven
Charles S. Tidball
Alfred P. Van Huyck
Vivian H. Walton
Bennetta B. Washington
Charles F. Westoff
*Montague Yudelman

Mildred Marcy, *Chair Emerita*
Conrad Taeuber, *Chairman Emeritus and Demographic Consultant*

Advisory Committee

Samuel Baum
Calvin L. Beale
Donald J. Bogue
Lester R. Brown
Philander P. Claxton, Jr.
Caroline S. Cochran
Mercedes B. Concepcion
Douglas Ensminger
Philip M. Hauser
Carl A. Huether
Jose Ruben Jara
Sam Keeny
Richard K. Manoff
M. A. Sattar
Benjamin Viel
Sloan R. Wayland

*Members of the Executive Committee of the Board of Trustees

The Population Reference Bureau is a private, nonprofit educational organization, founded in 1929. PRB members receive more than 25 informative publications each year: four annual POPULATION BULLETINS written by recognized authorities; the lively monthly news magazine POPULATION TODAY; the annually updated WORLD POPULATION DATA SHEET and UNITED STATES POPULATION DATA SHEET wall charts; the quarterly population education newsletter INTERCHANGE, accompanied twice a year by a self-contained student reading; and POPULATION TRENDS AND PUBLIC POLICY reports on the policy implications of current demographic trends, as they appear.

PRB also publishes the POPULATION HANDBOOK, a handy reference to the basics of demography, in a standard edition (revised and updated in 1985), International editions in English and other languages, and other special publications. Write for a listing and prices of publications in print. Membership prices are listed on the inside front cover of this Bulletin.

For more information, PRB's Information Resource Center responds to population-related inquiries by mail, telephone, or in-person visit. PRB's consulting service, Decision Demographics, provides personalized, in-depth data and analyses for individual clients seeking professional interpretation of population trends.

Members of the Population Reference Bureau support an organization that is dedicated to the objective analysis and reporting of one of the world's most compelling concerns.

ISSN 0032-468X

Population Reference Bureau, Inc.
777 14th St., NW, Suite 800, Washington, DC 20005
(202) 639-8040